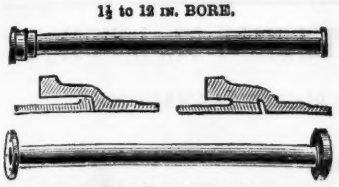
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1480.] LONDON, SEPTEMBER 22, 1891. [43RD YEAR. Price 6d.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.



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SOUTH STOCKTON-ON-TEES.

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SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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Capable of withstanding Greater Heat than that adequate to the Fusion of Iron.

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PURIMACHOS is regularly and increasingly used in **GAS-WORKS** at home and abroad, and has received the special commendation of the most distinguished Engineers and Managers, as invaluable for promptly and economically **building, glazing, repairing,** and **consolidating** RETORTS and FURNACES (in and out of action), PIPES, and ALL OTHER ERECTIONS (of Clay, Brick, or Iron) where FIRE or HEAT is employed—the action of which it will effectually resist.

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Which has now fully proved itself to be the most effectual, powerful, and perfect Apparatus in the World,

FOR PURIFYING GAS FROM

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Doing all the work of Purification between the Condensers and Purifiers, and relieving them of much work. Its cost is less than any other known Apparatus for purifying Gas from Tar and Ammonia.

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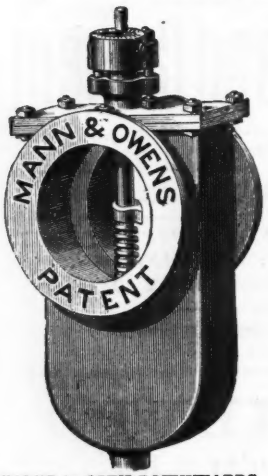
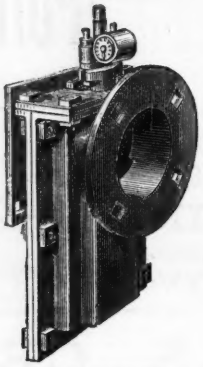


VALVE to OPEN DOWNWARDS.



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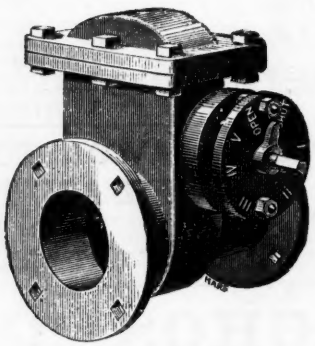
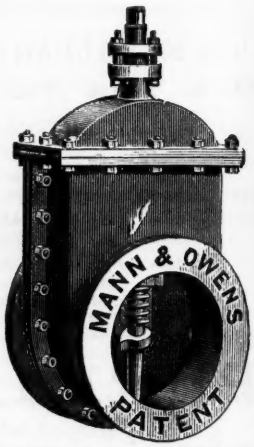


FULL-WAY RACK AND PINION VALVE.



VALVE to OPEN UPWARDS.

Also Makers of Pillar Valves, Self-acting Bye-pass Valves, Outside Rack and Pinion Valves, Hydraulic Main-Valves, Disc-Valves, and Special Valves of all kinds. Improved Gas-Exhausters, Steam-Engines, Steam-Cranes, Boilers. Blake's Patent Steam-Pumps for Tar, Water, and Ammoniacal Liquor, Hydraulic Coal-truck Lifts, Hydraulic Cranes, Hydraulic Apparatus for Lifting Purifier-Covers, and every description of Pumping Apparatus, &c., suitable or use in Gas-Works, made to order.

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WITH RACK & PINION,
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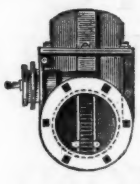
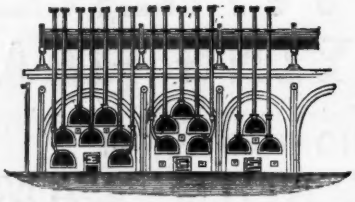
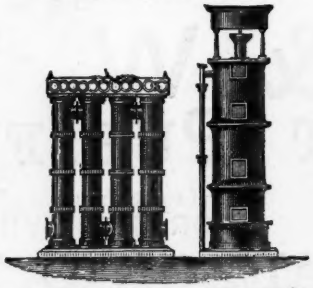
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.







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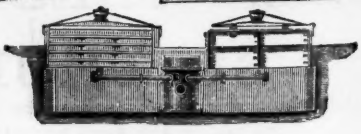

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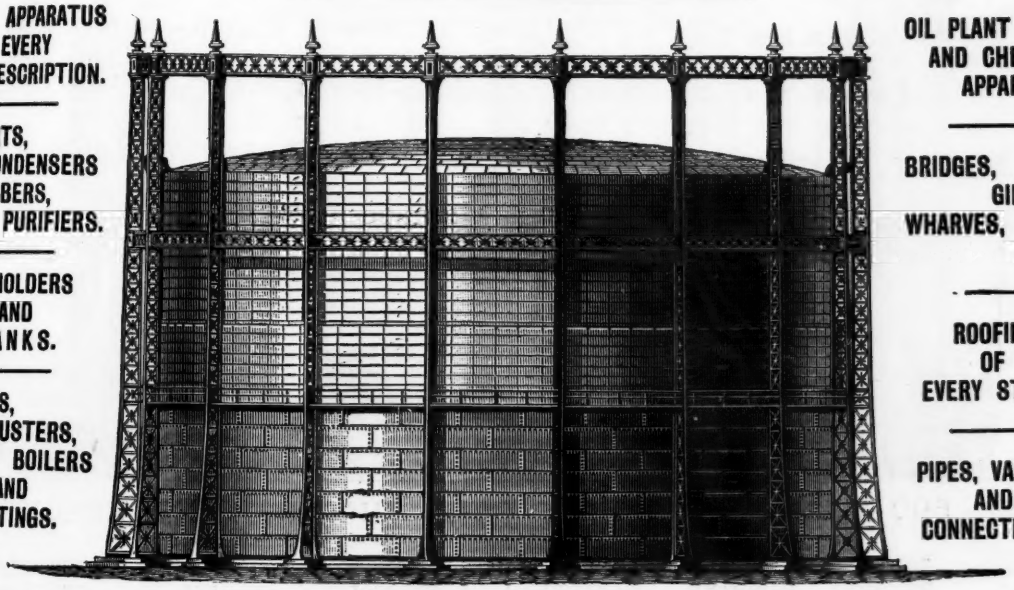

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BRIDGES, GIRDERS WHARVES, PIERS.

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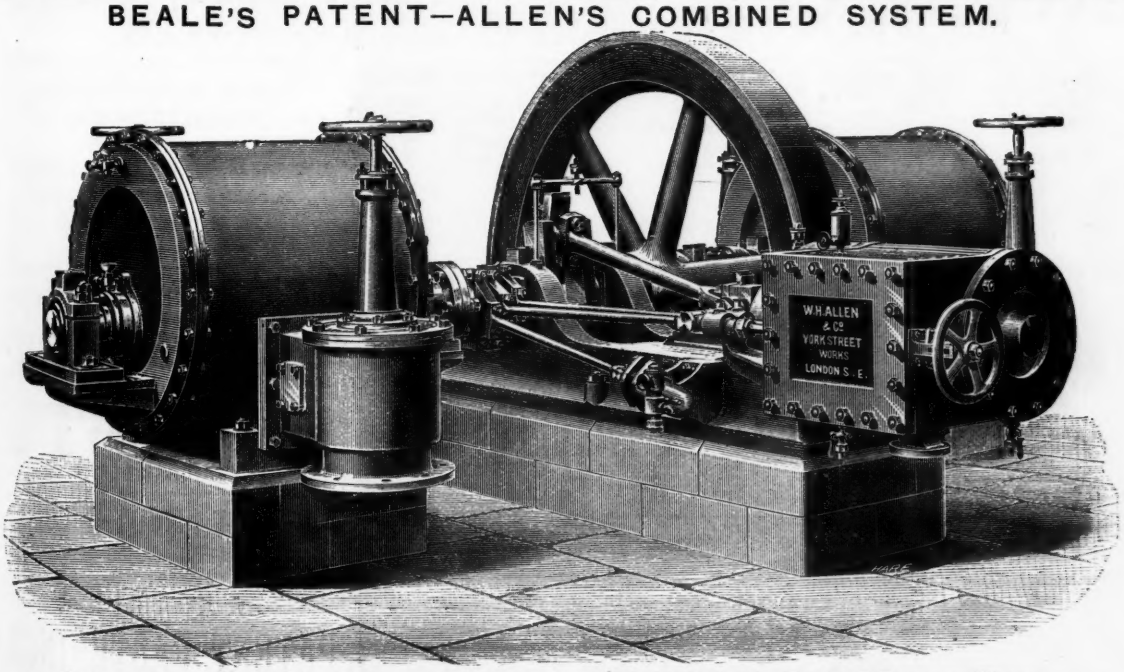

Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

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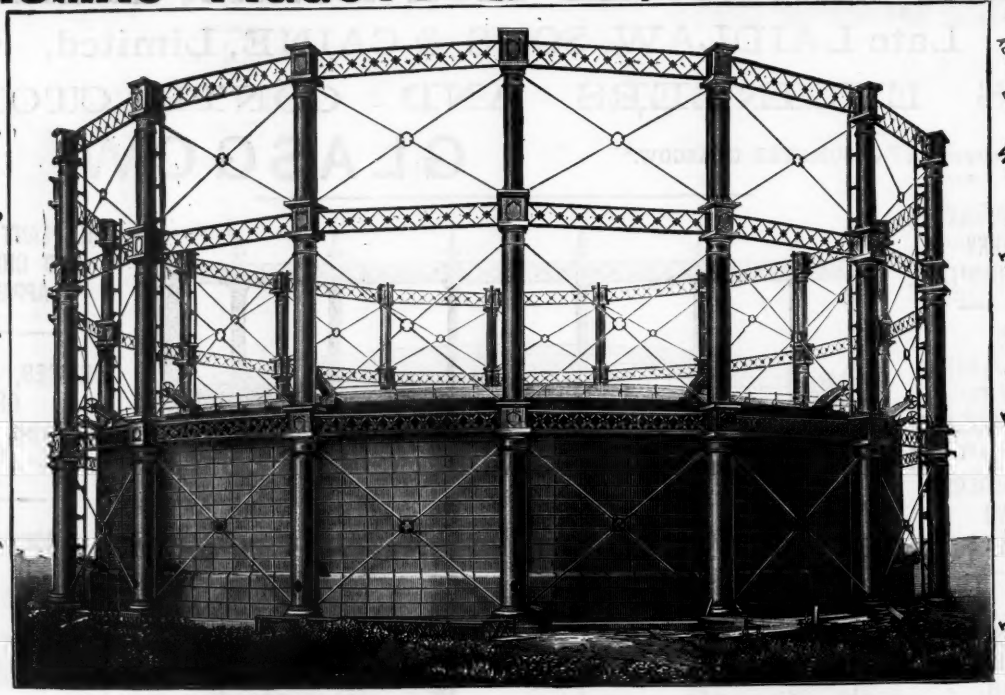

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OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

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(Mr. JOHN WEST, M. Inst. C.E., *Managing Director*),

Engineers, Ironfounders, and Contractors,

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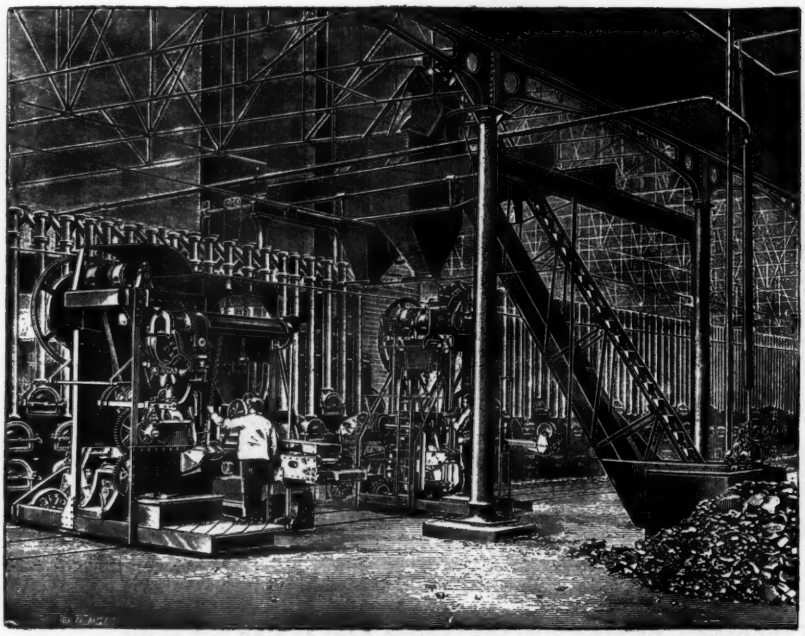
Manufacturers of

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **180** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.



INTERIOR OF RETORT-HOUSE, SHOWING WEST'S PATENTED POWER CHARGING AND DRAWING MACHINERY.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES.

COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY.

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OXIDE ELEVATING MACHINERY.

COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT.

RETORT MOUTHPIECES

WITH SELF-SEALING LIDS,

FITTED WITH

KING'S PATENT FASTENINGS.

N.B.—The whole of these Fittings are made of Wrought Iron.

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INCORPORATED IN
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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

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CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY OF GASHOLDERS

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GAS PLANT OF EVERY DESCRIPTION.

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GAS PLANT WORKS, NEWTON HEATH, MANCHESTER,

MAKERS AND ERECTORS OF

PATENT COLUMNLESS GASHOLDERS.

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED

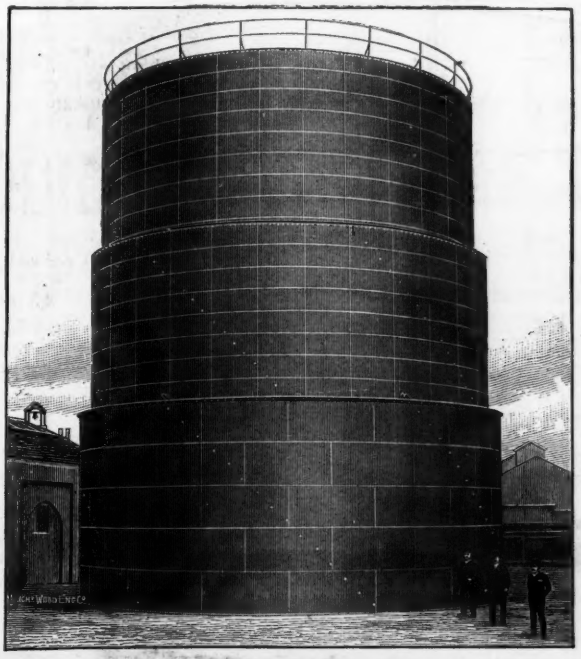
from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED

to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED.

The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder recently erected, in a wrought-iron Tank, for the Birmingham Oxygen Company, at their Works, Saltley, Birmingham. The bottom of the Tank is fixed level with the ground, upon a concrete foundation.

COST OF PAINTING SAVED

for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE;

And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

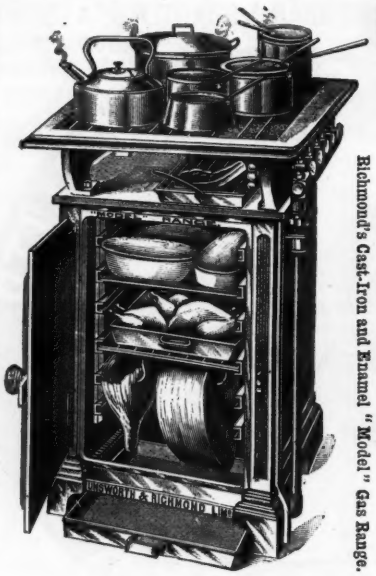
STABILITY UNDER WIND PRESSURE

of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.



The best Stove made for Hiring out purposes. Can be taken to pieces readily.

Richmond's Cast-Iron and Enamel "Model" Gas Range.

RICHMOND & CO., LTD.,

GAS APPARATUS MANUFACTURERS,

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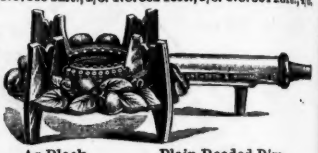
Quick Lever Grill.
No. 200 10×9×7½, 7/-. No. 205 12½×11×8, 10/-.

GREAT SUCCESS of RICHMOND'S MODEL GAS RANGE. Beat Six well-known Makers.

Nelson, June 2, 1891.

Burners suitable for heavy work.
No. 300 12ft., 2/6. No. 302 16ft., 3/6. No. 304 20ft., 4/-



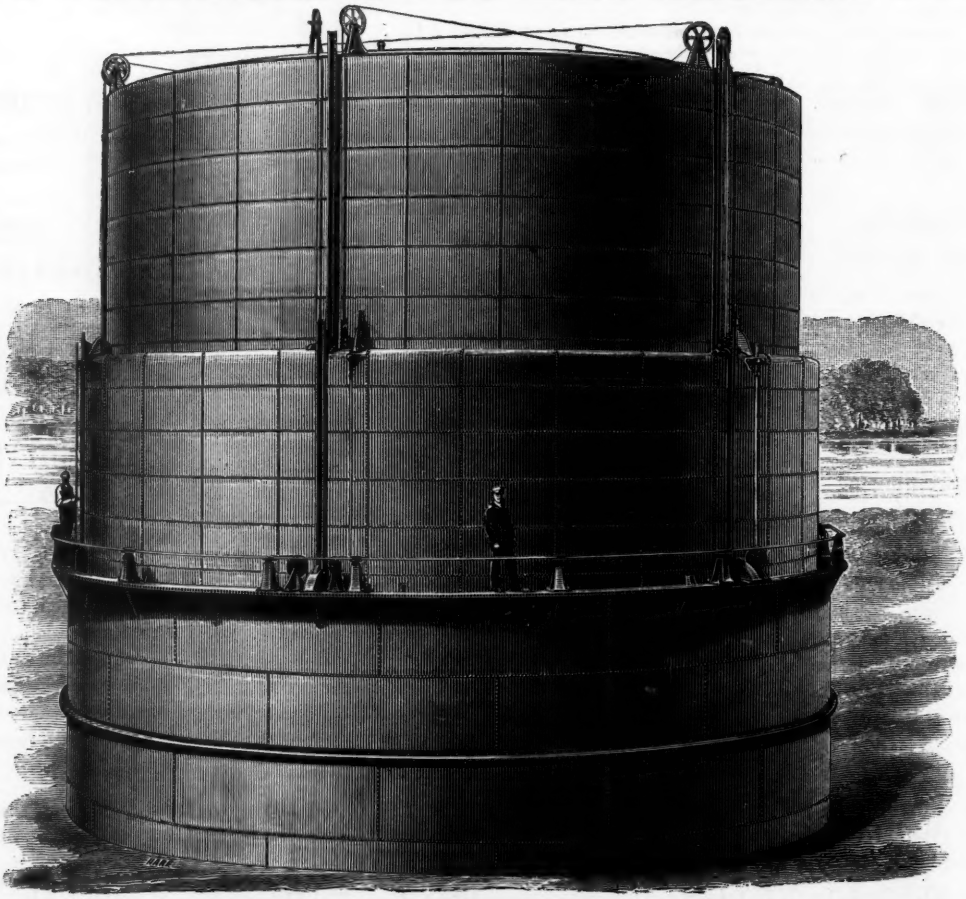
As Block.
No. 306, 1/8.
No. 309, 2/6.

Plain Reeded Rim.
No. 313, 1/6.
No. 314, 2/6.
No. 315, 3/-

Hot Plate Burners, all loose for cleaning. Jet and Cock combined. Best Stove Extant. Repeat Orders Daily. Try it!

ASHMORE, BENSON, PEASE, & CO., LTD.,

STOCKTON-ON-TEES.



TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

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CORNWALL WORKS, BIRMINGHAM.

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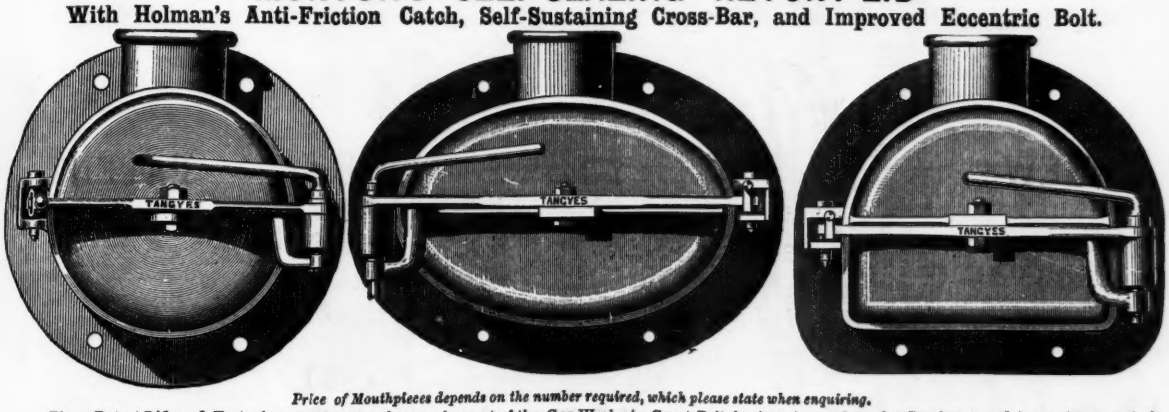
MORTON'S SELF-SEALING RETORT-LID

With Holman's Anti-Friction Catch, Self-Sustaining Cross-Bar, and Improved Eccentric Bolt.



Price of Mouthpieces depends on the number required, which please state when enquiring.

These Retort Lids and Fastenings are in extensive use in most of the Gas-Works in Great Britain, America, and on the Continent, and have almost entirely displaced the older method of sealing by a luting of lime or other material. The Lids are made in three forms, round, oval, and D (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these lids are recommended to make their selection, in order to avoid cost of pattern making, delays, &c., &c.

Mouthpieces with Circular Lids for Round Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	Lid and Fittings without Mouthpiece.
3494	14 ins.	14 ins.	12½ ins.	£0 19 0
2982	15 ,,	15 ,,	14 ,,	1 0 0
3453	15 ,,	15 ,,	12⅝ ,,	1 0 0
3497	15 ,,	15 ,,	15 ,,	1 0 0
3630	16 ,,	16 ,,	10½ or 11⅝ ,,	1 1 0
4549	16 ,,	16 ,,	15½ ,,	1 1 0
6262	16 ,,	16 ,,	13½ ,,	1 1 0
6396	16 ,,	16 ,,	15 ,,	1 1 0
7668	16 ,,	16 ,,	17⅞ ,,	1 1 0
10289	16 ,,	16 ,,	11 ,,	1 1 0
3356	17 ,,	17 ,,	15 ,,	1 3 0
7125	17 ,,	17 ,,	6 ,,	1 3 0
933	18 ,,	18 ,,	11⅝ ,,	1 5 0
4045	18 ,,	18 ,,	14 ,,	1 5 0
6397	18 ,,	18 ,,	15 ,,	1 5 0
8013	18 ,,	18 ,,	15 ,,	1 5 0

Taper Circular Mouthpieces with Circular Lids for Round Retorts.

Pattern No.	Front. Back.			
13001	15 to 21 ins.	21 ins. diam.	13½ ins.	£1 0 0
13261	15 ,, 24 ,,	15 ,,	13⅝ ,,	1 0 0
12995	15 ,, 30 ,,	30 ,,	13 ,,	1 0 0
9562	18 ,, 21 ,,	21 ,,	12½ ,,	1 5 0
10425	18 ,, 21 ,,	21 ,,	4½ ,,	1 5 0
13418	18 ,, 22 ,,	22 ,,	12 ,,	1 5 0
13396	20 ,, 20⅝ ,,	20⅝ ,,	4 ,,	1 11 0

Mouthpieces with Circular Lids for D Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	Lid and Fittings without Mouthpiece.
5348	14 ins.	14 × 13 ins.	7 ins.	£0 19 0
14209	14 ,,	14 ,, 13 ,,	13½ ,,	0 19 0
14231	14 ,,	12⅝ ,, 12⅝ ,,	10 ,,	0 19 0
3463	15 ,,	15 ,, 13 ,,	14 ,,	1 0 0
6678	15 ,,	15 ,, 14 ,,	12 ,,	1 0 0
3661	15½ ,,	15½ ,, 13 ,,	12 ,,	1 1 0
13052	16 ,,	16 ,, 13 ,,	18 ,,	1 1 0
5601	16 ,,	16 ,, 14 ,,	15 ,,	1 1 0
6827	16 ,,	16 ,, 14 ,,	17 ,,	1 1 0
4494	16 ,,	16 ,, 14 ,,	14 ,,	1 1 0
3548	16 ,,	16 ,, 15 ,,	12⅞ ,,	1 1 0
6677	16 ,,	16½ ,, 13½ ,,	12½ ,,	1 1 0
9645	16 ,,	16½ ,, 13½ ,,	12½ ,,	1 1 0
4434	16 ,,	17½ ,, 14 ,,	14 ,,	1 1 0
6469	16 ,,	18 ,, 14 ,,	15 ,,	1 1 0
9015	16 ,,	18 ,, 14 ,,	16½ ,,	1 1 0
4327	16 ,,	18 ,, 15 ,,	15½ or 19 ,,	1 1 0
8049A	16 ,,	18 ,, 15 ,,	17⅞ ,,	1 1 0
6137	16 ,,	20½ ,, 13½ ,,	12½ ,,	1 1 0
5918	17 ,,	18 ,, 14 ,,	14 or 17 ,,	1 3 0
5053	17 ,,	19⅝ ,, 13 ,,	14½ ,,	1 3 0
7548	17 ,,	20 ,, 13 ,,	15 ,,	1 3 0
6468	17 ,,	20 ,, 16 ,,	15½ ,,	1 3 0
4316B	17 ,,	21 ,, 14 ,,	14 ,,	1 3 0
7975	17 ,,	21 ,, 15 ,,	14½ ,,	1 3 0
13459	17 ,,	21½ ,, 13½ ,,	15 ,,	1 3 0
14284	18 ,,	18 ,, 13½ ,,	19 ,,	1 5 0
12990	18 ,,	18 ,, 15 ,,	15 or 19 ,,	1 5 0
7135	18 ,,	18⅝ ,, 15 ,,	13 ,,	1 5 0
10221	18 ,,	18 ,, 16 ,,	19⅝ ,,	1 5 0
4506	18 ,,	20 ,, 13 ,,	19½ ,,	1 5 0
6470	18 ,,	20 ,, 13 ,,	15 ,,	1 5 0
6818	18 ,,	20 ,, 15½ ,,	17½ ,,	1 5 0
13998	18 ,,	20 ,, 14 ,,	19⅝ ,,	1 5 0
4083	18 ,,	20 ,, 15 ,,	16 ,,	1 5 0
5306	18 ,,	20½ ,, 14 ,,	18½ ,,	1 5 0
13295	18 ,,	20½ ,, 14 ,,	19½ ,,	1 5 0
7356	18 ,,	20½ ,, 15½ ,,	13 ,,	1 5 0
4569	18 ,,	21 ,, 14 ,,	18 ,,	1 5 0
3628	18 ,,	21 ,, 15 ,,	16 ,,	1 5 0
13999	18 ,,	22 ,, 14 ,,	19½ ,,	1 5 0
7640	18 ,,	22 ,, 12½ ,,	13½ ,,	1 5 0
14250	19 ,,	19 ,, 14 ,,	19 ,,	1 8 6
14286	19 ,,	20 ,, 13½ ,,	20 ,,	1 8 6
7971A	20 ,,	20 ,, 15 ,,	18 ,,	1 11 0
14285	20 ,,	21 ,, 13½ ,,	19 ,,	1 11 0

Mouthpieces with Circular Lids for Oval Retorts.

Pattern No.	Diam. Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	Lid and Fittings without Mouthpiece.
13658	14 ins.	14 × 12 ins.	15 ins.	£0 19 0
4356	14 ,,	18½ ,, 12 ,,	12⅝ ,,	0 19 0
6851	15 ,,	16 ,, 14 ,,	18 ,,	1 0 0
3629	15 ,,	16½ ,, 13½ ,,	14 ,,	1 0 0
3580	15 ,,	21 ,, 15 ,,	15 ,,	1 0 0
6264	16 ,,	16½ ,, 15½ ,,	15⅝ ,,	1 1 0
5210	16 ,,	20 ,, 14 ,,	15 ,,	1 1 0
6263	16 ,,	24 ,, 16 ,,	18½ ,,	1 1 0
5370	17 ,,	20 ,, 14 ,,	14 ,,	1 3 0
6832	17 ,,	20 ,, 14 ,,	17 ,,	1 3 0
6183	17 ,,	20 ,, 15 ,,	15 ,,	1 3 0
4289	17 ,,	21 ,, 15 ,,	14 ,,	1 3 0
5270	17 ,,	22 ,, 14 ,,	14 ,,	1 3 0
3631	18 ,,	18 ,, 14 ,,	20 ,,	1 5 0
3681	18 ,,	21 ,, 14 ,,	13½ or 15 ,,	1 5 0
3554	18 ,,	21 ,, 15 ,,	14⅝ ,,	1 5 0
7957	18 ,,	22 ,, 16 ,,	14 ,,	1 5 0
8048A	19 ,,	25½ ,, 15 ,,	18 ,,	1 8 6

Mouthpieces with Oval Lids for Oval Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimensions of Retort.	Length of Mouthpiece.	Lid and Fittings without Mouthpiece.
9800	18 × 14⅞ ins.	18 × 14⅞ ins.	15 ins.	£1 5 0
9205	20 ,, 12 ,,	24 ,, 14 ,,	10½ ,,	1 10 0
10000	20½ ,, 14½ ,,	20½ ,, 14½ ,,	16 ,,	1 10 0
9680	21 ,, 15 ,,	21 ,, 15 ,,	15 ,,	1 12 0
10056	21 ,, 14½ ,,	21 ,, 14½ ,,	15⅝ ,,	1 12 0
13218	21 ,, 15 ,,	21 ,, 15 ,,	17 ,,	1 12 0
10514	22½ ,, 13⅝ ,,	22½ ,, 13⅝ ,,	15⅝ ,,	1 13 0
13766	20 ,, 17 ,,	20 ,, 17 ,,	15½ ,,	1 15 0
13269	24 ,, 15 ,,	24 ,, 15 ,,	18 ,,	1 18 0
13884	24 ,, 15 ,,	24 ,, 15 ,,	10 ,,	1 18 0

Mouthpieces with D Lids for D Retorts.

Pattern No.	Dimensions of Mouth.	Internal Dimension of Retort.	Length of Mouthpiece.	Lid and Fittings without Mouthpiece.
12292	15½ × 13 ins.	15½ × 13 ins.	12 ins.	£1 2 0
9967	16 ,, 14 ,,	16 ,, 14 ,,	15⅛ ,,	1 3 0
13574	16½ ,, 13½ ,,	16½ ,, 13½ ,,	12½ ,,	1 4 0
9899	18 ,, 12 ,,	18 ,, 12 ,,	14 ,,	1 4 0
12980	16 ,, 16 ,,	16 ,, 16 ,,	18 ,,	1 6 0
13900	18 ,, 13½ ,,	18 ,, 13 ,,	15 ,,	1 6 0
9912	18 ,, 13½ ,,	18 ,, 13½ ,,	17 ,,	1 6 0
9962	18 ,, 13½ ,,	18 ,, 13½ ,,	16 ,,	1 6 0
10982	18 ,, 13½ ,,	18 ,, 14 ,,	15 ,,	1 6 0
11098	18 ,, 14 ,,	18 ,, 14 ,,	12 ,,	1 6 0
9492	20 ,, 13 ,,	20 ,, 13 ,,	15 ,,	1 10 0
9208	20 ,, 13 ,,	20 ,, 13 ,,	19½ ,,	1 10 0
10251	20 ,, 13 ,,	20 ,, 13 ,,	15½ ,,	1 10 0
12964	20 ,, 13 ,,	20 ,, 13 ,,	13½ ,,	1 10 0
9909	20 ,, 13½ ,,	20 ,, 13⅝ ,,	17 ,,	1 10 0
12969	19½ ,, 15½ ,,	19½ ,, 15½ ,,	14 ,,	1 11 0
13781	20 ,, 15 ,, Front. / 21 ,, 15 ,, Back.	21 ,, 15 ,,	15 ,,	1 11 0
14287	20½ ,, 14⅞ ,,	20½ ,, 4⅞ ,,	17 ,,	1 11 0
7692	21 ,, 15½ ,,	21 ,, 15½ ,,	16 ,,	1 11 0
12978	20 ,, 16 ,,	20 ,, 16 ,,	17 ,,	1 11 0
13252	20 ,, 16 ,,	20 ,, 16 ,,	18 ,,	1 11 0
13220	21 ,, 15 ,,	21 ,, 15 ,,	17 ,,	1 11 0
13992	21 ,, 16 ,,	21 ,, 16 ,,	17 ,,	1 11 0
8977	21½ ,, 13½ ,,	21½ ,, 13⅝ ,,	18⅝ ,,	1 12 0
8978	21½ ,, 13½ ,,	21½ ,, 13⅝ ,,	18½ ,,	1 12 0
10497	21 ,, 13½ ,,	21 ,, 13⅝ ,,	18⅝ ,,	1 12 0
8037	21½ ,, 13½ ,,	21½ ,, 13⅝ ,,	18½ ,,	1 12 0
9908	21½ ,, 13½ ,,	21½ ,, 13⅝ ,,	15 ,,	1 12 0
10404	21½ ,, 13½ ,,	22 ,, 14 ,,	18⅝ ,,	1 12 0
12410	21½ ,, 13½ ,,	22 ,, 14 ,,	12 ,,	1 12 0
13822	21½ ,, 13½ ,,	22 ,, 14 ,,	15 ,,	1 12 0
10515	22½ ,, 13½ ,,	22½ ,, 13⅝ ,,	13½ ,,	1 12 0
7924	24 ,, 14 ,,	24 ,, 14 ,,	15⅝ ,,	1 13 0
13807	24 ,, 15½ ,,	24 ,, 16½ ,,	16 ,,	1 14 0
9015B	25 ,, 14 ,,	25 ,, 14 ,,	19½ ,,	1 14 0
10932	25 ,, 14 ,,	24 ,, 14 ,,	18⅝ ,,	1 15 0
12944B	22 ,, 16 ,,	22 ,, 16 ,,	16 ,,	1 15 0
14037	22 ,, 16 ,,	2 ,, 16 ,,	16 ,,	1 15 0
14119	22 ,, 16 ,,	22 ,, 16 ,,	18 ,,	1 15 0

Patterns marked A have Sockets at back to connect to Retorts; all the others are flanged. Patterns marked B have curved bottoms.

Telegrams: "TANGYES BIRMINGHAM."

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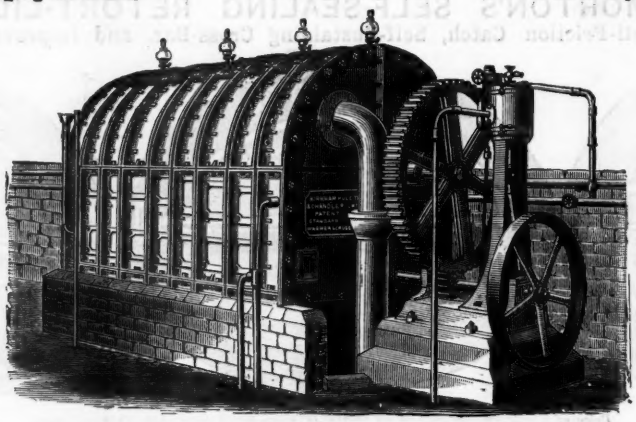
KIRKHAM, HULETT, & CHANDLER'S

[SIDNEY HERSEY, Managing Director.] (LIMITED) [J. CHANDLER, Engineer.]

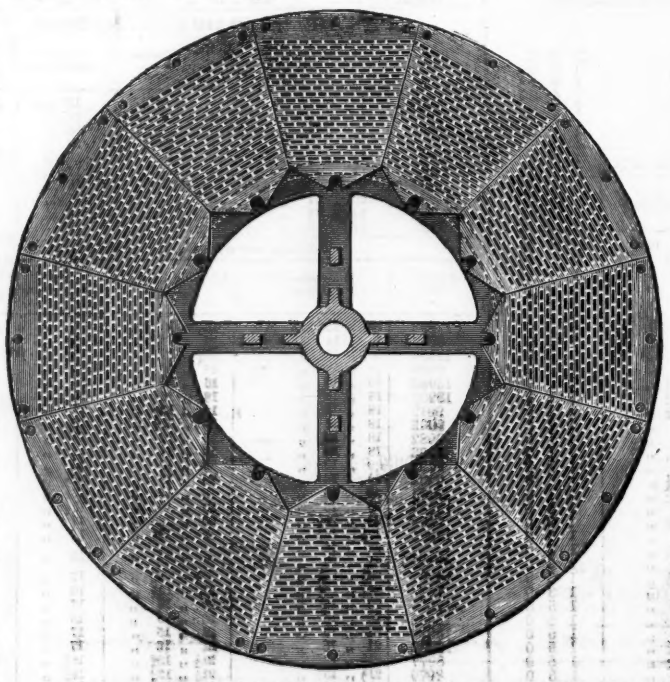
NEW  PATENT

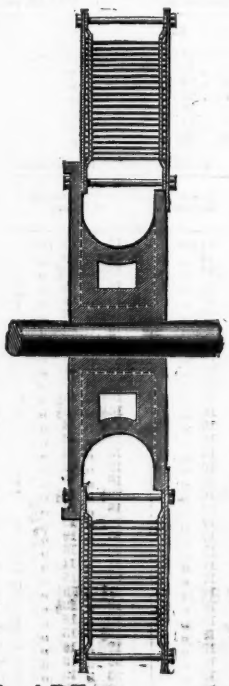
"STANDARD" WASHER-SCRUBBER.

KIRKHAM, HULETT, & CHANDLER, Limited, have pleasure in drawing the attention of Gas Engineers and others interested in the question of the extraction of ammonia and other impurities from Coal Gas to their new Patent "Standard" Washer-Scrubbers, of which 44 are at work and in course of construction.

The original "Standard" Washer-Scrubber (of which 368, equal to a daily capacity of 318,560,000 cubic feet of gas, have been supplied) was admittedly the best machine in the market for the purpose for which it was designed; and the experience gained by the Company during the past nine years has resulted in the production of an improvement on the original patent which has been applied to **23** old pattern machines, and may be briefly described as follows:—

In place of the indented iron sheets made up in segments, and technically called "Bundles," the washing surfaces are now constructed of wooden laths kept in position by being passed through slotted iron sheets, and then butting on to plain sheets, bolted together as shown.





THE ADVANTAGES OF THIS SYSTEM ARE:

(1) The Driving-Shaft of the Washer-Scrubber is relieved of five-sixths of the weight (the weight of the Wooden bundles being only one-sixth of those in Iron).
(2) The weight in motion is only one-sixth of that in the original "Standard" Washer-Scubbers.
(3) The driving power required, and "wear and tear" are enormously reduced.
(4) The washing surfaces keep perfectly clean and free from deposit from end to end of the machine.

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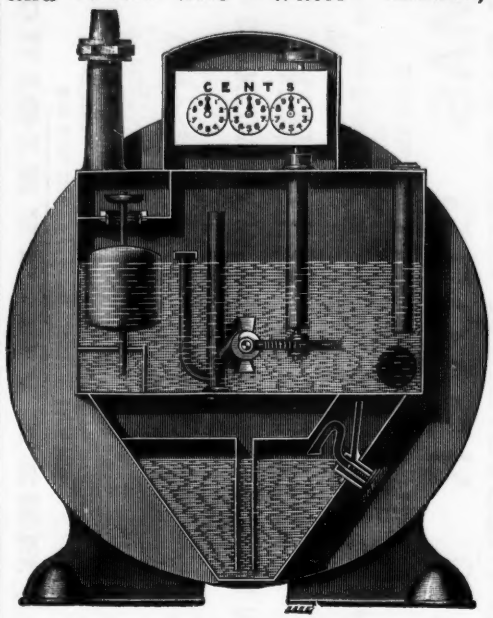
THE SYPHON OVERFLOW

— Wm. Cowan's Patent. —



To suppose, as some do, that the main object of the "Syphon Overflow" is to promote the convenience of inspectors and others who "water" meters, is to misapprehend the chief purpose of the invention. That the convenience of inspectors is promoted by the Syphon Overflow is a fact that admits of no doubt whatever, because the watering of meters is thereby greatly facilitated; but it is a mistake to fix attention upon this result, and to regard it as the only one attained. To do this is to lose sight of the chief purposes the Syphon Overflow was designed to secure.

These purposes were—

1st.—The **speedy** attainment of **exactly the same water line** on each occasion of watering.

2nd.—The **absolute certainty** of this water line being attained.

3rd.—The **impossibility** of any water afterwards finding its way into the waste-box.

The first and second of these conditions secure the interests of the gas company, whilst the third greatly promotes the convenience of the consumer, for reasons that are well known.

Who that has had experience of Wet Meters does not know the disadvantages of the "Low Spout?" The slowness with which it adjusts the water line, and the patience required while this is being done, are matters of every-day experience. It is therefore no wonder that the "Syphon Overflow" is regarded as one of the most important improvements ever made in the Wet Gas-Meter. It is not only an important improvement **in itself,** but it possesses the property of making all previous improvements more valuable and effective. It has, indeed, made the Wet Meter a more perfect, and, in every way, a more satisfactory instrument.

Narrow views as to price often prevent the adoption of real improvements; but it would be a narrow view indeed which would prefer a "Low Spouted" Meter to one with a "Syphon Overflow," because of the trifling difference in the price of the two.

W. & B. COWAN,

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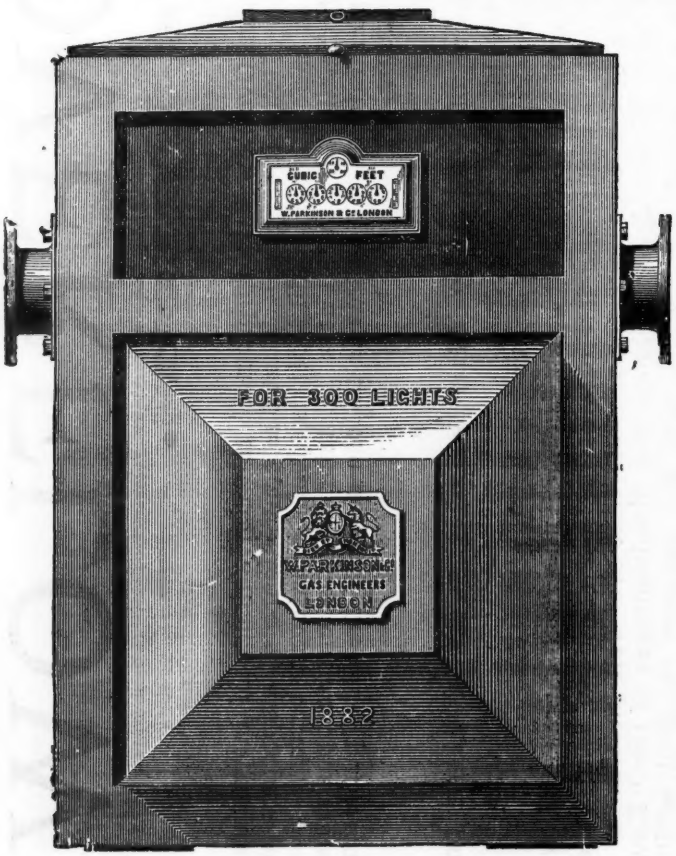
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & Co.



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[See also Advt., p. 556.

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THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 22, 1891.

Mr. W. Livesey on the Bristol Gas Act.

In another column will be found a long, and it may also be said, a laboured defence of the new Bristol Gas Act, by Mr. W. Livesey, who as Agent for the Bill may be supposed to take a *quasi*-paternal interest in it. His interest is not, however, absolutely paternal, because he was not actually the author of the whole Bill, and he is particularly careful not to claim the paternity of the hardly-spoken-of stock-splitting device. We appreciate the pains taken by Mr. Livesey, in this as in so many other instances, to explain points of parliamentary practice for the benefit of readers of the JOURNAL. He is always ready to unlock the store of his unequalled experience and ripe wisdom, for the information of the public; and his patience in dealing with criticism is inexhaustible. If anybody could make out a case for the Bristol Bill, it is Mr. Livesey; and his letter, in response to our comments of July 14 on this measure, is cleverly compiled. We admit this; and grant, as fully as his merits demand, the general competence of the Bristol Company's advocate as an authority on parliamentary questions. All the same, the letter fails to move us from our original position. We are even less disposed than ever, after what transpired at the recent general meeting of the Company, to change our position, as expressed in the article of July 14. What our attitude might have been, if Mr. Livesey's explanation of the reasons for doubling the nominal amount of the Company's capital had reached us early in the year, and had been supported by other spokesmen for the Company in and out of Parliament, it is difficult now to say, and useless to speculate upon. It is sufficient for us to remind Mr. Livesey that this time he seems to speak only for himself. Whenever the Chairman of the Company has referred to the stock-splitting device, it has been to excuse it as a grand invention for altering the aspect of the Company's business in the eyes of the local public, and even of their own workmen. And, not content with this, at the last general meeting he congratulated the proprietors upon the improvement in the market value that may be expected to ensue upon the division of the Company's stock. It may be, as Mr. Livesey now says, that their peculiar circumstances rendered the process of stock-division rather easier, and less objectionable to a Parliamentary Committee, than it would be in the case of any other British Company. His remarks upon this head may even be construed into a warning to other gas directors who may be thinking of going to Parliament next session, against hoping for an extension of this indulgence—for whatever it may be worth—to their own undertakings. He will not admit that the Bristol Bill slipped through Committee by a stroke of good luck; and he naturally speaks well of the bridge that carried him over. But we entertain our own opinion with regard to that point. On the general principle that the nominal rates of dividends upon Gas Companies' new capital are too high, there is a good deal to say, which we prefer not to discuss in connection with the Bristol "dodge"—for it is nothing more. If Mr. Livesey thinks the occasion ripe for a general revision of the scale of Gas Companies' statutory dividends, and a reconsideration of the subject of premiums, we shall be happy to accommodate him with reasonable space for the purpose. But it must be discussed in a free and general way.

The Eastern Counties Association Meeting.

THE Eastern Counties Gas Managers met at Cambridge on Wednesday last, under the presidency of Mr. John Carter, of Lincoln, and spent a very pleasant and instructive day. The man, however unacademical his life and occupation, who could not enjoy himself for a day, or for the matter of that, for several days, in an old English University City is hardly worth his entry upon the census-paper. But apart from the attractions of the old seat of learning on the Cam, there were many professional reasons why the Eastern Counties Gas Managers should have rendered themselves before Mr. Carter last week in the satisfactory numbers that marked the meeting as one of the most successful in the brief history of the Association. The visitors were welcomed to Cambridge by the Mayor and the Chairman of the Gas Company, and were generally made much of during their stay in the city. A large sprinkling of non-members attended the meeting—including Mr. W. A. Valon, the President of The Gas Institute, and several friends of the Association from the bordering districts on the north and south. Indeed, it will soon be necessary for the Committees of these District Associations to resolve themselves into a United Delimitation Commission, for the purpose of marking off their respective natural territories, unless gas managers occupying border-towns are to be distracted by the claims to their support of different Associations. Mr. F. Weller, of Southtown, Yarmouth, read a paper upon the management of small gas-works, and was followed by Mr. F. A. Ward, of Amersham, upon gas-works rating. The President-elect, Mr. C. E. Jones, of Chesterfield, also interested the meeting in a discussion on the subject of coal supply, which was well sustained. Visits to some of the colleges of the University and to the gas-works filled up the day, which was brought to a close by a dinner. The only point of criticism we are inclined to bring against the proceedings is the scale upon which they were planned, as it necessitated, for many of the visitors, remaining in Cambridge the night—that is to say, the taking up of two days for this particular meeting. We are bound to be consistent in maintaining the position we have always assumed with regard to the meetings of the District

Associations of Gas Managers—that they should, whenever possible, be so ordered that the majority of the members can attend them and return home again within the day. For guests from distant regions there can, of course, be no law; but we hold that the Committees of these Associations are bound to consult the convenience of their own members, and especially of such as cannot face the addition of an uncertain amount of hotel expenses to the nominal cost of membership of a society of this class. The Eastern Counties is the youngest of English District Associations of Gas Managers, and we hope it will set a good example to the others where anything of the kind is needed. Its membership must be mainly composed of men having control of small works; and it is the circumstances of these gentlemen, rather than those of the bigger men who can afford to belong to and attend the meetings of two or three District and one National Association, that should be suited in the scheme of administration. There has been no harm done up to the present; but the tendency to the grandiose is a besetting temptation that needs to be constantly guarded against by Committee men of every District Gas Managers' Association in the kingdom—not more so in the east than elsewhere, perhaps; but certainly not less.

The Concerns of Two Gas Companies.

Noteworthy disclosures have been made at recent Gas Companies' meetings, and if we can only refer particularly to one or two examples, by way of marking the general tendency, it is only because the limitations of our space forbid us to discuss others in detail, and because there would be a great deal of sameness in the different localized versions of the story. The accounts of the Crystal Palace District Gas Company tell a striking tale of increasing business and falling profits. When the half-yearly profits of a gas undertaking only amount to one-third of the sum required for the dividend, notwithstanding the fact that the business done increases "by leaps and bounds," it becomes evident that something peculiar is affecting the trade; and when on the top of this revelation comes another to the effect that a sum of money representing one-third of the profit actually made, has been spent to prevent an increased assessment, it is obvious that something will have to be done to restore the accounts of the undertaking to a healthy condition. We trust, however, that nobody will gather from these remarks that the Company are in what might reasonably be called a bad way. They have an ample reserve of strength, which can be easily evoked if the trading of the ensuing half-year should not show an improvement on the last. The Sheffield United Gaslight Company is another concern which generally furnishes interesting matter for the student of gas supply in its commercial phase. Sir Frederick Mappin, M.P., the Chairman, is a personality to be reckoned with; and his public pronouncements are the more interesting from the circumstance that they reveal the passing moods of the speaker. The Chairman of the Sheffield Company is never twice alike in this regard; he may be ebullient on one occasion, and despondent on another. Generally, it may be said, Sir F. Mappin is distinctly combative, after a gloomy fashion. He often—as we hold unnecessarily—gives the Company's officers a "bad quarter of an hour" when he gets on his feet in a general meeting, by blurting out a variety of statements which had far better have remained within his directorial breast. He means well, of course; and the mistakes he makes are due to his over-mastering desire to be candid to the local public. But he overdoes it. Much that comes within the cognizance of a gas director is "caviare to the "multitude," and had better, in the public interest, be kept for home consumption. However, the Chairman of the Gas Company is known in Sheffield; and on this account less harm is done than might otherwise follow. The position of the Sheffield undertaking is more favourable than that of many others, inasmuch as there is no sound of an increase in the price of gas. Technically, there have been troubles in Sheffield with regard to naphthaline in the distributing system, and the proportion of unaccounted-for gas. Having discovered other places worse off in both these regards, Sir F. Mappin is more reconciled to the case of the Sheffield Company than he would otherwise have been. An important part of the business of the recent Sheffield meeting was the increase then effected in the remuneration of the elected Directors, to £1500 a year which is cheap enough in the circumstances. The Bristol Directors cost considerably more; and they are, to say the least of it, not an improvement on the Sheffield Board.

A Socialistic Fracas.

Those amiable persons, ecclesiatics and others, who have allowed themselves to be easily persuaded that the New Unionist movement was a spontaneous upheaval of the Spirit of Labour, must possess a strange quality of Faith if their first impression with regard to this matter has not long ago been rubbed out. The peculiar ease with which the movement has from the first been open to be exploited by self-interested persons, should have placed observers on their guard with respect to the *bona fides* of the mushroom growth of so-called Labour leaders. But, unfortunately, many well-meaning philanthropists fell victims to the rant or the guile of adventurers so disguised. The thing began to look very queer, however, from the moment when men like Thorne, real labourers as they had been, found themselves compelled by pressure of circumstances to accept the proffered co-operation of the professional agitators—the "black coat" gentry—whom they began by despising. Experience and natural aptitude tell in the long run in the agitators' trade as in every other occupation; and the labouring element in the ranks of New Unionism was all too soon obscured by the Socialists and Atheistical lecturers, the railway-arch orators, and the market-place debaters, who could talk the mere workmen "off their feet." Thorne is a good speaker at a mass meeting, when his blood is up; but he labours under the disadvantage of needing to believe in his case before he can put it effectively from the platform. Not so the members of the Stock Company of London Spouters with whom he is now fain to associate, very few of whom ever did a day's hard work in their lives—or if they ever worked, have left it off for a more profitable career these many years. The rottenness of the New Unionist cause was proclaimed to the world without screen or excuse, however, when the notorious Dr. Aveling and the equally well-known Mrs. Eleanor Marx Aveling were formally adopted as leaders by the Gas Workers' Union. Nothing more was needed to exhibit the movement as a mere branch of the Socialistic Anarchist tendency, which, under various names, has been recognized through the ages as the manifestation of the Spirit of Denial in civil matters. Whatever may be said of Academic Socialism, it is very certain that the Anarchism which takes the embodiment, now of a New Unionist with scarf and banner, now of a Russian Nihilist, now of a German Social-Democrat or a French Communist, is the enemy of everything that keeps society together, and redeems culture from falling into fiendish intellectualism recognizing no morality but its own pleasure. Of Thorne and his labourers, it may pointedly be asked, "What they are doing in that galley?" They sent Dr. Aveling to represent the horny-handed gas stokers at the International Labour Congress at Brussels. There he came to loggerheads with a brother Socialist, whom of course, according to his principles he ought to love, but whom as a matter of fact he regards with feelings the reverse of the theoretically fraternal. And for this there is so much reason, as an ordinary person can perceive, in the fact that Dr. Aveling's brother according to his profession seems to know something not altogether to Dr. Aveling's credit, and goes about hinting very unpleasant things of him. The other Socialist, indeed, made himself so objectionable to the Gas Workers' Socialist, who had designed to make a little, in the capacity of Secretary, out of his position as a representative British workman, that last week the latter committed a common assault upon the former, and was fined at the North London Police Court 40s., and costs, for the offence. We are not disposed to repeat the tale of this miserable squabble and scuffle, which is only worth mentioning for the indication it affords of the degree in which these Regenerators of Society love one another, and of the kind of people who are now working the New Unionist movement. It is all in the weekly newspapers, of course, and may be trusted to have its due effect upon the public mind. Those who profess to believe that Peace and Plenty will come at once when every demand of the New Unionists is conceded, may be asked whether this wretched Aveling-Gilles incident does not, so far as it goes, encourage the notion that surrender to the Forces of Anarchy would be the signal for the outbreak of the most bitter civil strife the world has ever known.

News Concerning Fuel Gas.

THERE is some interesting news from different quarters concerning the actual and prospective condition of the fuel-gas question. For reasons which no one conversant with Yankee methods of business will need to have explained, the Municipal Authorities of Chicago have decided to add to the attractions of their city for the Exhibition period an additional competing Gas Company, who are chartered to supply fuel gas, as well as lighting gas, upon terms calculated to rejoice the heart of the critics who jeer at democratic municipal management. Meanwhile, it is reported in a local newspaper that the attempt of the Laclede Gas Company of St. Louis, to bring non-luminous fuel gas into household use in that city, is a failure, and will shortly be abandoned unless the consumption is largely increased. The gas affairs of St. Louis have been much discussed in the American technical journals —superfluously so, it might be thought, considering the scale of the place. But it cannot be denied that a fuel-gas experiment on a large scale is enough to render any town in which it is being tried interesting for the time being. In this case Colonel W. A. Stedman, the General Manager of the Company, reports that, as the result of a general canvass of the district covered by the fuel-gas mains at the commencement of the summer, 80 consumers were secured for this variety of the Company's output, which was priced at 40 cents., or say 1s. 8d. per 1000 cubic feet—a phenomenal figure in the annals of the American gas industry. With such a selling price to draw public attention to the venture, the Gas Company expected to rapidly increase the number of their consumers; but they have been disappointed. The public did not like the new kind of gas—it was too slow in action, as compared with common luminous gas. The objection was made by some of the consumers that "as the fuel "gas required larger volumes to be consumed, and a "longer period of continued use, in order to produce "results, a great quantity of heat was lost by radiation, "resulting in raising both the temperature of the room, "and of the cook, unnecessarily." That experience is worth placing on record, which states how a consumer preferred the gas with which breakfast could be got in only 20 minutes rather than the lower-priced gas that required 45 minutes for the same purpose. So the original fuel-gas consumers of the St. Louis Company have diminished by one-half, although this kind of gas is sold for 40 cents per 1000 cubic feet as against 118 cents for the same Company's illuminating gas, which has only double the heating value. In another column will be found the particulars of Colonel Stedman's statement. As a last chance of making the fuel-gas department pay, it has now been decided to reduce the price to 30 cents. If this does not attract consumers, the experiment will be stopped. It occurs to a professional critic, who has no other source of information upon the subject than Colonel Stedman's remarks, that these are not quite conclusive with respect to the necessity of the sluggish action of stoves, and especially of boiling rings, supplied with fuel gas. Would not these work quickly enough if their rate of consumption were increased correspondingly with the inferior calorific power of their fuel? It can be easily understood that a boiling ring which would be efficient with a consumption of (say) 15 cubic feet of illuminating gas per hour, would be irritatingly slow with fuel gas of only one-half the heating power. But would the same annoyance be experienced with an apparatus of double the delivering capacity? In the case of a small cooking utensil—such as a pint kettle or saucepan—there might be the further drawback of insufficient surface to absorb the whole heat of a large flame. But this objection would hardly apply to a large pot or kettle of proper shape for gas heating. These observations are so obvious that they may be uncalled-for in the present case. We, however, offer them with all respect to Colonel Stedman, because the St. Louis fuel-gas experiment is so interesting that it would be a great pity if it were dropped without trying every expedient to keep it going for a sufficient time to render the results conclusive. There is the question of gas-engines, for instance, which Colonel Stedman does not mention. We know that, with the necessary modification of the feeding arrangements, gas-engines work very well indeed with Dowson gas, which is quite as poor as the St. Louis fuel gas can possibly be. The most powerful gas-engines ever yet used are supplied with gas of this character; and according to the unimpeachable testimony of M. Witz, they show a remarkable economy in running with gasified fuel at the price obtaining in Rouen. What is possible in France, ought not to be unattainable in St. Louis. The possibility of distributing fuel gas from a central generating station is being tested practically, however, elsewhere than in the Western States; but we are not conversant with the results. The Danish Gas Company are arranging to supply the summer consumption in one of their towns with fuel gas; and whether the experiment succeeds or fails, we may hope to hear all about it at the proper time from the Company's enterprising Engineer, Mr. F. D. Marshall.

WATER AND SANITARY AFFAIRS.

THE Birmingham correspondent of *The Times* has been giving a long account of the project now on foot for affording that city a supply of water from the sources of the Elan and the Claerwen in Mid-Wales. In April last we discussed the merits of this scheme, and certainly see no occasion at present to alter the views we then expressed. The subject is important in its bearing on the broad question of the appropriation of watersheds, and on the policy of supplying large towns with water from remote sources. Concerning the watersheds, it is perfectly clear that Birmingham is in hot haste to secure the waters of the Elan and the Claerwen, owing to an apprehension that the London County Council are about to seek a supply from Mid-Wales, in accordance with the report of their Engineer (Mr. A. R. Binnie). But the London County Council are without power to bring such a scheme before Parliament, though they might obtain authority for that purpose next session, and at the same time bring in a Bill for taking a supply from the head waters of the River Wye, including the portion desired by Birmingham. If the London County Council and the Birmingham Corporation both desire to draw water from Mid-Wales, it remains to be seen whether the district will furnish a sufficient supply for both; and if not, which has the greater right, or the greater need. So far as necessity goes, it is not yet proved that London has any need to draw upon Mid-Wales. On the other hand, Birmingham was advised twenty years ago to enlarge its system of water supply by adopting a scheme virtually identical with that which is now proposed. At last, delay has become dangerous, owing to the increasing demand due to an augmented population, and because of the rivalry of the London County Council. During the twenty years which have elapsed since Sir R. Rawlinson drew up his now famous report on the Birmingham water supply, at which time the existing water-works belonged to a Company, great changes have developed themselves, and the appropriation of the watersheds in connection with the supply of the large towns has become a serious and complicated matter. When the Birmingham Bill comes before Parliament, the merits of the scheme as it affects the Metropolis will certainly undergo discussion. The Birmingham City Council have approved the project; and there is every prospect that Parliament will be forthwith asked to sanction it. But the water supply now assumes a national aspect; and Parliament will be expected to see that Birmingham is not unduly favoured. Whether Manchester ought to have been allowed to absorb Thirlmere, may be questioned, though in that respect the die is cast. But wisdom may be exercised henceforth, so that no community may be damaged for the benefit of a big neighbour. A general inquiry on the subject seems to be called for, in order that Parliament may be properly enlightened respecting the facts and principles involved, as affecting not merely one locality, but the entire kingdom.

The writer in *The Times* begins his article on "The New "Birmingham Water Supply" by referring to the water supply of London—a circumstance indicative of the relationship between the two. But while Birmingham is stated to be threatened at an early date with a deficiency in the supply of water, we are told that "in the case of "London, happily, there is no reason to apprehend any "immediate failure of the supply, even in face of the "rapidly-growing needs of a population of five millions." The London Companies, we may observe, are supplying water to a population nearer six millions than five. Having disposed of the question of quantity, the author

of the article goes on to signify that London's dilemma has reference to the quality of the water, which is such as to render it "year by year less fit for consumption." We do not know where the writer finds his authority for this statement. Dr. Frankland, in his last annual report, has declared that the Thames water distributed during the years 1889 and 1890 was "superior to that of any former "year as regards comparative freedom from organic "impurity;" while, concerning the Lea water of 1890, the same authority says that the supply "contained "markedly less organic matter than at any time during "the previous twenty-two years." Certainly these official statements fail to show anything like a yearly degeneration in respect to quality. Taking a more recent period, and speaking of the month just past, with its extraordinary amount of rainfall, Dr. Frankland reports that the water from the Thames "maintained the improved quality" which it exhibited in July. So also we find Messrs. Crookes, Odling, and Tidy reporting that "throughout "the month of August, notwithstanding the excessive and "often stormy rainfall, the character of the water supply "to the Metropolis continued to be eminently satisfactory." There is nothing proved, though much has been asserted, against the quality of the London water. Proof is in its favour; and the evidence to this effect is so strong that those who desire change have lately relied more especially on the argument that London is draining the rivers dry. As for the quantity which London consumes, we cannot pretend to vie with those cities in the United States, where the capacity of the supply is described as "unlimited," and where the daily average supply per head ranges from 57 gallons up nearly to 200 gallons. New Orleans, we observe, has 31 gallons. London is credited in the American Census reports with a supply of 28·3 gallons per head daily, which happens to be under the mark. American gallons, also, are not as English, 83 of ours being equal to 100 of theirs. As to the propriety of setting up the Birmingham scheme as an example for London, we may refer our readers to an excellent letter addressed to the JOURNAL by Mr. E. Chesshire, F.R.C.S., of the former city, and published in our columns on the 1st inst. London is situated in the midst of an enormous watershed, and is environed by chalk hills containing immense subterranean supplies of the purest water. The very existence of the Thames, with its frequent floods, supplemented by the Lea, implies the contiguity of abundant resources, commensurate with all the needs of the Metropolis and its suburbs. As yet, there is no adequate proof that London ought to incur the expense and the risk of taking a supply from Wales, or from any other remote locality. The financial part of the Birmingham scheme is assuredly of such a nature as to warn the Metropolitan ratepayers as well as water consumers against any projects of that description.

The Death of Mr. John Glover, of the firm of Messrs. Thomas Glover & Co., is announced as having taken place last Friday, at his residence at Hornsey. The deceased gentleman was in his 89th year.

The Salford Gas Case.—In the High Court of Justice last Tuesday, before Mr. Justice Henn Collins, an application was made in the case of the *Queen v. Kershaw* for an order to transfer the indictment to London, in order that the trial shall take place at the present sessions at the Central Criminal Court. His Lordship made the necessary order.

Connecting Metal to Glass for Laboratory Purposes.—A useful alloy for this purpose, it is said, may be made of 95 per cent. of tin and 5 per cent. of copper. The alloy is prepared by pouring the proper proportion of melted copper into the molten tin, stirring round with a wooden stirrer, casting or granulating, and remelting. It adheres strongly to clean glass surfaces, and has nearly the same coefficient of expansion as glass. It melts at about 360° C. By alloying it with 0·5 to 1 per cent. of lead or zinc, it may be rendered softer or harder, or more or less easily fusible.

The Approaching Release of Samuel Hunter.—Alluding to the report as to the near approach of the time when Samuel Hunter will be released from prison, as referred to in last week's issue, a Lancashire correspondent writes: "So far the men who have displayed most bitterness against Hunter have had no opportunity of expressing an opinion on the subject of his pending release. When they have, the result will probably be seen in a fresh outcry for the prosecution of those who were concerned in the scandal. There is, however, no probability of anything being done in this direction; and, with Hunter's restoration to freedom and retirement into obscurity, we may hope to hear the last of the sorry business."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 546.)

THE week just concluded has seen some fluctuation in prices in many of the markets in the Stock Exchange. The opening was dull—thanks in some measure to the relapse into foul weather, which had the effect of depressing railroad securities—and matters did not improve as the day progressed. The Mitylene occupation *canard* completed the decline of the day. The next day, however, brought a rebound of prices, especially when the *canard* was despatched. The favourable adjustment of the heavy settlement was another factor which largely assisted in rehabilitating confidence. A rather large withdrawal of gold, which caused rates to harden in the Money Market, had the effect of administering a check to the rise in prices; but again a recovery set in, and further advances were effected. The rise in American rails continues unabated. Gas has been exceedingly quiet; attention having been diverted from the undertakings purveying that illuminant to the electric lighting companies, in which a good deal of more or less speculative dealing has been going on. Gas securities, however, have not shown any tendency to fall as a result of the neglect. In Gaslight issues, the "A" has been moderately dealt in at steady figures. It was done at 233 at the opening of the week, and it marked the same price on the closing day, with not much variation in the interval. Some business was done in the debentures, and the "H" 7 per cent. limited; but prices were not remarkable. South Metropolitans met with little attention. Prices were, however, pretty good, except for the "B." A single transaction in the old stock was all the business marked in Commercial. That Company's meeting will be held on the 9th prox.—a week later than usual, owing to the London County Council having adjourned for their autumn vacation before the Company's accounts had been approved by them. This compels the Company to await the re-assembling of the Council a few days hence, before the accounts can be approved, audited, and presented. All the rest of the Companies, Suburban, Provincial, and Foreign, of every description, may be dismissed with very few words. There have not been a dozen transactions in the whole array of them; and they are almost without feature. Imperial Continental is 1 lower; but Crystal Palace *ex div.* quotation is 2 higher. The Water Companies have been quiet; but they continue to rise—most of them having effected an advance of from 1 to 5 per cent.

The daily operations having been so restricted, do not require to be recounted in detail. In the Gas Market, the fall in Imperial Continental took place on Tuesday. But the tendency subsequently was better; and on Friday, the stock marked 233. The improvement in the Water Companies commenced on the opening day; and by Thursday the complete advance had been effected.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting Companies and New Industries—The Prospects of Electrical Heating—The Fortunes of the Bath Electric Light Company.

THE controversy that has filled the correspondence columns of *The Times* on the interesting subject of the growth of electric lighting in London, has at last died away, leaving the different parties to the discussion very much where they were, which is the usual result of such contests. In bringing up the rear of the disputants, Mr. A. A. Campbell Swinton has submitted a new point for the consideration of readers of *The Times*, to which he ascribes "great importance as affecting the future financial success of the electrical supply companies." This is, the prospect that "we shall shortly see a very considerable demand arise for electric energy for industrial purposes—not for producing motion or for lighting, but for new industries, largely metallurgical, that are only now commencing to appear." As examples of his meaning, Mr. Swinton cites "the electrical extraction of phosphorus, aluminium, and other metals, electric welding, electro-chemical processes." When further developed, he thinks that these new industries "will present an immense and remunerative field for utilizing the spare generating machinery of electric supply stations during the hours of daylight; and as has proved in some instances to be the case with regard to the bye-products of the gas industry, they may in time come to be an even greater source of profit than the lighting for which the electric supply companies were originally formed." It seems hard-hearted to deny the companies in question the solace which Mr. Swinton kindly offers them in these comforting words; but regard for the higher claims of Truth impels us to dash the prospect out of serious thought. It is impossible to accept the statement that the day consumption of a lighting medium is analogous to a good market for a residual product of the industry which provides the medium. Gas companies have their day consumption too; but they do not regard it as in any sense of the term a "residual" business. Moreover, when a so-called day consumption of either gas or electricity clashes with the regular business, as it must do in the short winter days, to say nothing of times of fog, it becomes an additional burden instead

of a source of extra profit. But apart from this consideration, it remains to be seen, before Mr. Swinton's consolation can be regarded as valid—first, that electrical industries such as he refers to pay in themselves; and secondly, that even so the electricity required for them can be advantageously bought from a supply company instead of being generated on the user's premises by the agency of steam or gas power.

An American electrician makes the assertion that "the practicability of electrical heating has recently been receiving its conclusive demonstration." This would at one time have been regarded as grave news for the gas industry, as sounding the knell of the hopes of gas manufacturers for the development of a heating and cooking business when their present trade in lighting has been taken from them. The world has learnt to take the statements of electricians more calmly, however, than the American correspondent of *The Times* did the famous news of Edison's success in subdividing the electric light. The public, to use a proverbial expression that is not always remembered at the right time, "lives too near the woods to be frightened by the owls." It would require something very strong indeed, coming from an electrician, to induce the weakest gas shareholder to sell a single parcel of his stock; and therefore it is possible to discuss alarmist rumours calmly, even though they relate to such an important matter as electrical heating. The report now under notice turns out upon close investigation to be singularly baseless, even for an electrician's prophetic utterance. A Mr. W. R. B. Willcox says that "the time has come when apartments, wherever situated, on land or sea, moving or stationary, *may* be warmed by electricity;" and after the manner of his kind, forthwith rhapsodizes upon "the thought that all the useful effects of combustion, as employed for the comfort of man, may by a slender wire be brought into our homes." When will the electricians learn that this sort of thing is not evidence, and that the public are no more to be amused by dreams?

At the recent statutory meeting of the Bath Electric Light Company, explanations of the position of the undertaking were offered from the chair, which indicate the nature of the constitution of these West of England electric lighting concerns. Three new Directors have lately joined the original Board, one from the Brush Company, one from the Callender Company, and another from the Laing, Wharton, and Down Syndicate, all of whom are large shareholders. These gentlemen are called Directors; but if they were designated by the less respectable description of "men in possession," the truth would not be gravely outraged. It appears that of the 13,500 shares of the Company offered for subscription, only 3241 have been taken up. Nor is the business in a much healthier state than the capital account. The machinery at the central station only runs for a portion of the day and night, and is hardly employed even then to the fourth part of its capacity. The Directors find that the householders of their district evince an unfortunate reluctance to incur the cost of fitting their premises for electric lighting. Nothing is said about the cost of the service when the fittings are provided; but we should say that this consideration is not overlooked by the good people of Bath. The Board flatter themselves that the Company has a good prospect, only "it must have time." This, it may be remarked, is more a question for the Company's creditors, and not for the public. The public is always willing to give a new venture "time;" but it does not follow that in this sense of the term it is a synonym for money.

Mr. Robert Austin, the General Secretary of the Amalgamated Society of Engineers, died early last Saturday morning, after a long illness, at his residence, 89, Stamford Street, S.E.

The Incorporated Association of Municipal and County Engineers intend holding a meeting (the first in Ireland) at Dublin on Friday and Saturday next. The first item in the paper of business is a visit to the Dublin Water-Works at Roundwood. The two papers to be read are on the sanitary and other works carried out by the Corporation of Dublin, by Mr. Spencer Harty, the City Engineer, and on road maintenance by Mr. R. H Dorman, the County Surveyor of Armagh. Various places of interest are to be visited; and there will be a reception and luncheon by the Lord Mayor.

Presentation to Mr. D. P. Mudie.—A presentation was recently made by the officers, past and present, of the Gas Department, and the workmen employed at the Swan Village Gas-Works of the Birmingham Corporation, to the late Superintendent, Mr. David Palmer Mudie, upon his retirement after nearly 40 years' service—formerly with the Birmingham and Staffordshire Gas Company, and since the transfer with the Birmingham Corporation Gas Department. The testimonial comprised an elaborate pair of bronzes, together with a handsome marble dining-room timepiece, upon which a suitable inscription had been engraved recording the circumstances of the occasion. It was originally intended to make the presentation at the works; but Mr. Mudie wrote stating that his health would not permit him to make the journey from Warwick for the purpose, and expressing his great regret at his inability to attend. A deputation, therefore, consisting of the oldest member of each of the Departments, was appointed to make the presentation to Mr. Mudie at his house. This was accordingly done; and Mr. Mudie suitably acknowledged the gifts.

A DISCUSSION OF THE SMOKE NUISANCE.

In last week's JOURNAL, a letter from Mr. H. Reginald Sibson on the subject of the Smoke Nuisance reminded our readers that, with the waning of another summer, the problem of smoke and fog rises once more, formidable as ever, to confront the town-dwellers of England. We are grateful to Mr. Sibson for supporting the argument so often advanced in these columns—that a good deal of the trouble from domestic smoke might be avoided by the universal use of gas-stoves and coke fuel for kitcheners, which, wherever adopted, carry with them immunity from smoke in the atmosphere for at least half the year. Mr. Sibson is right in hinting that the enthusiastic advocacy of the gas-stove by gas companies may in some places tend to defeat its own end, by suggesting an interested motive; but the fact remains, that where this advocacy has been most persistently and intelligently carried on, the gas-stove is usually better and more favourably known than it is in localities where an exaggerated fear of being misunderstood deters the gas company from engaging in such propaganda. Meanwhile, it is obviously desirable that newspapers, and other means of influencing public opinion, should be led to support the plan of dealing with the smoke nuisance, in detail, by the increased employment of gas and coke as fuel for domestic purposes, rather than to let the whole matter stand over in expectancy of some great "invention" to revolutionize British practice in cooking and heating. Newspapers, however, require to be set in motion in the proper way before they will move. Journalists like to think when they essay a subject of the popular-science order that they receive the sympathy of their public; and the best means of conveying a sense of this truth to the mind of a newspaper editor is to ply him with signed letters on the subject. If gentlemen in different parts of the country who think with Mr. Sibson will only convey their views to the editors of the newspapers which possess most influence in their districts, the effect will soon become visible in the increased interest which this topic will excite in journalistic circles.

It is necessary, however, that persons who take an intelligent interest in the smoke problem should keep their information posted up to date. Although it is true that, apart from the detail methods of attack by gas and coke already referred to, the smoke question stands in very much the same position year by year, it is none the less true that from time to time there is news of its being stirred up afresh, or held up to study in a novel aspect, by scientific men. The last occasion of this being done was at the recent meeting of the International Congress of Hygiene and Demography, when, besides the very casual mention made of the subject by Sir Henry Roscoe, in the course of his address as President of the Chemical and Physical Section, papers on Town Fogs and on various matters connected with aerial sanitation were read by Dr. W. J. Russell, F.R.S., Mr. A. Fletcher, and others, as noticed in our article on the Congress which appeared in the JOURNAL for the 18th ult. (p.299). Although the full text of these papers has not yet come to hand, and it is possible that we may have something to say about their more suggestive portions when we are able to study them at leisure, yet we desire, as the whole subject has been broached once more in our correspondence columns, to make a few remarks on what transpired in regard to it at the meeting, in order that if Mr. Sibson and others should take our counsel, and do their best to force the matter before newspaper readers, they may have some recent material to bring into the unending controversy.

The discussion of Town Fogs and their effects occupied the section a whole day. The subject, as opened by Dr. Russell, is seen to occupy a different position in the eyes of scientific men since Mr. Aitken laid the foundation of our present knowledge of the constitution and nature of fogs, by his work of 1880 on the influence of dust in the atmosphere upon the precipitation of moisture. The object of Dr. Russell's paper, besides its recapitulation of Aitken's results, was to show that these had been confirmed by the author. He drew especial attention to the accumulation of carbonic acid in the air of confined spaces during fogs; having determined on one occasion a rise of volume of this constituent of air from 4 to 14·1 volumes per 1000 of air. A fog is therefore an unpleasant proof of the existence of impurity in air; its colouring matter being due mainly to the products of imperfect combustion of coal, and its density being referable to the quantity of dust produced by street traffic, as well as to the constant disintegration and destruction of refuse. Dr. Russell had no difficulty in showing, from the records of Metropolitan meteorological stations, that the number of fogs occurring in London is on the increase. This increase is naturally consequent on the growth of London in size and in its consumption of coal for fuel—which has risen from 4,880,000 tons in 1875 to 6,390,000 tons in 1889. Having shown that fogs prevail in London under anticyclonic conditions of the atmosphere, coincident with a fall of temperature, Dr. Russell wisely observed that the increased death-rate which usually accompanies foggy seasons may be largely or wholly due to the low temperature instead of the fog itself. He roundly declared it to be a mistake to suppose that fog increases the mortality of a town to any great extent; for he had himself found in the Registrar-General's return four cases in which the presence of fog had not increased the death-rate of London, and these periods were also those in which the temperature variation was

not great. Dr. Russell quoted Dr. Percy Frankland as testifying to the freedom of foggy air from bacteria, which goes some way to rehabilitate the idea that sulphurous acid gas in the air acts as a disinfectant.

On other hand, this small mercy is swamped by the positive discomforts and damages directly due to fog. Most prominent of these is the absence of light. Professor Thiselton Dyer has shown that the deleterious effect of fog upon plants is compounded not only of the poisonous influence of sulphurous acid gas, and possibly of hydrocarbons, upon growing vegetation; but also of the loss of light. Although heat rays seem able to permeate fog, however dense, the shutting off of the refrangible rays of light, which are the most actinic, by fog must diminish the oxidizing effect of moist air, and so hinder the work of aërial self-purification. In contradistinction to the statement of Dr. Frankland, it was remarked that Dr. Koch has found light to be an effective germicide. This view seems more in harmony with common experience. Dr. Russell made a point of the economical advantages that would follow the restoration to London of the light intercepted by fogs, remarking that the increased consumption of gas in London on a foggy day represents an outlay by the public of £3125. We are not concerned to question the truth of this figure; but we take leave to remark that it is a very partial, and therefore unscientific way of trying to bring home to the public mind the loss of money due to fogs. It is, of course, true that when daylight fails by reason of dense fog gas must be burnt to supply the deficiency; but the money spent by the public on this account is anything but so much clear gain to the gas companies. As to the effect of fog upon the electric lighting companies, it is simply disastrous. Although the same cannot be said of the gas companies, it is not less true that of all influences which tend to increase the demand for light, fog is the one which gas manufacturers like least and could best spare.

It is to be regretted that Dr. Russell said no more than this about the cost of a fog. He should have known that the expense to the public of extra gas is not a moiety of the cost of a foggy day in London. The railway companies alone pay more than the sum he mentions every day of a fog, in order to keep the traffic going to and from the Metropolitan stations. In Mr. W. M. Acworth's book upon the Railways of England—a most interesting volume, by the way—will be found some impressive observations on the subject of working railway traffic during times of fog, which tend to convince the reader that an increased gas bill is not by any means the chief evil to be endured during such seasons by all who live or have business in towns. Indeed, instead of talking about the cost of the gas-burners necessitated by foggy days, in London or elsewhere, it would be more rational to express thankfulness that there is gas to be had in such emergencies.

It is a known fact that "Science is Measurement;" and we look for aid in grappling with the smoke nuisance to the labours of men like Aitken, and the researches which the Committee of the Manchester Field Naturalists' Society are carrying on. Ill-instructed enthusiasm, as represented by the leading spirits of the Smoke Abatement Institute, has flickered out without effecting any useful end. How little calculated this society is, or ever was, for doing any good work in the matter of smoke prevention, may be understood from the remarks of its originator, Mr. Ernest Hart, in the course of the discussion on Dr. Russell's paper. He spoke of the difficulty which had to be contended with in "rousing public opinion" on the question; and remarked that the Smoke Abatement Institute had been instrumental in framing legislative measures which had been approved by a Committee of the House of Lords, but which had been "thrown out through the influence of Lord Wemyss and other property owners." Now this speech is the whole condition of the Smoke Abatement Institute in a nutshell. Not knowing anything of the practical aspect of the question from first to last, Mr. Ernest Hart, and those who associated themselves with him in his (once) fashionable movement, shut their eyes to the existence of its practical difficulties, and pretended that they could purify the air of London from smoke by "rousing public opinion," and slipping some preposterous Bill through Parliament. If Lord Wemyss has been instrumental in knocking such legislative projects on the head, he has acted for the good of the community by protecting them against the spirit of rampant Faddism for which the Smoke Abatement Institute has furnished a refuge, to its own destruction. Nobody has done more to bring the Smoke Abatement Institute into disrepute than the Faddists; and whenever one of these talks about penalizing the owners of smoky chimneys, we always feel inclined to administer the oath to him, and then ask how often he has his own chimneys swept.

However, after many doctors had addressed the section on the subject of the relation of town fogs to public health, and had disagreed, as usual, Sir Henry Roscoe proposed, and Mr. Ernest Hart seconded, the following resolution, which was carried by the section, in these terms: "That this Section of Chemistry and Physics in relation to Hygiene, requests the President of the Local Government Board and the Home Secretary to take into consideration whether legislative measures cannot be introduced to lessen the amount of smoke produced from dwelling-houses in towns, and thus diminish the density and mitigate the evil effects of town fogs." There is little objectionable in the scope of this resolution, if there is little suggestive in it. For our own part, we regard its proposition and adoption as one of the saddest indications of weakness, and even helplessness, that a so-called scientific body has allowed to escape from it within recent times. Did the gentlemen who supported this appeal to the Government to "see whether anything could be done" realize the opportunity they were opening for the most damaging of retorts? The President of the Board of Trade and the Home Secretary might well reply to the resolution by an expression of extreme willingness to move Parliament in the matter under discussion if the Institute would kindly show them what to do. The Institute thinks it would be a nice thing to have a Smokeless London. So does Government, and so does everybody; but where is the utility of asking a Government Department to "do something" when nobody can say what should be done? In passing this resolution, the Institute followed the lead of Mr. Ernest Hart; and he made it look as futile as his own little society in Margaret Street. For what can Government do but help to give legislative force to the conclusions of science; and where is the judgment of science in regard to smokeless domestic fires? When it is a question, for example, of the means to be taken for reducing the danger of using lighting oils, or handling explosives, Government directs the attention of experts to the subject and acts on their advice. The smoke abatement people reverse this mode of procedure, and though professing to be experts, proclaim their inability to advise, and merely call upon Government to legislate in the dark. To pass an Act of Parliament and see what comes of it, is hardly a procedure that can be recommended as scientific legislation.

This, then, is the present condition of the smoke abatement question: The nuisance of smoke is being attacked practically at one end by means of gas-stoves and coke firing, to say nothing about improved methods of stoking for industrial purposes. What has been done in this regard is a trifle in comparison with what remains to be done; but every little advance is a gain. At the other end, philosophers like Lodge and Aitken are bringing the phenomena of fog under the rule of law, and thereby helping the world to understand their causes, and realize what possibility there may be of grappling with them on the grand scale. At both ends are the workers, and between them are the talkers, who patronize both and do nothing themselves. From whatever source the desired purification of town air from smoke may come, if it is ever brought about, whether by the development of some grand "invention," or by the more general employment of known means of reducing the evil, we may be sure that it will not be discovered by virtue of an Act of Parliament passed in advance of the information of the day.

Gas for Railway Carriage Lighting.—In addition to the 200 carriages on the Brighton Railway which are now being arranged to be lighted by Pintsch gas, as reported in last week's issue, we understand that the Company have ordered a trial of gas on the system controlled by Messrs. Pope and Son, of Slough, in a similar number of carriages.

The Sanitary Institute Lectures.—Among the lectures for which arrangements have been made in connection with the Sanitary Institute is one, on Oct. 9, by Sir Douglas Galton, K.C.B., &c., entitled "Ventilation, Warming, and Lighting;" one, on Oct. 13, by Dr. G. Reid, on "Water Supply, Drinking Water, and Pollution of Water;" and one, on Oct. 14, by Professor H. Robinson, on "Drainage."

The New Manager of the Harrogate Gas-Works.—Following up the intimation given in our issue of the 8th inst. (p. 441), as to the resignation of Mr. P. H. Wilkinson from the position he held for so many years as Engineer and Secretary of the Harrogate Gas Company, we now learn that the Directors of the Company have appointed as their Assistant Engineer Mr. Bertie W. Richardson, who for five years has acted in the capacity of Assistant to Mr. Wilkinson. Mr. Richardson executed the whole of the plans, and is superintending the erection of the buildings for the storeage of coal at the works, a description of which appeared in the JOURNAL for Oct. 28 last year. The Directors have also adopted a scheme of Mr. Richardson's for the development of an estate which the Company have placed on the market. It is situated near the gas-works; and the scheme embodies the erection of a number of artizans' dwellings.

"A Question of Nomenclature."—Under this title, reference was made in our editorial columns last week to a suggestion that more discrimination should be used in the choice of words descriptive of gas heating and cooking "stoves." On this subject, a correspondent writes: "You are under a misapprehension; the educated gas engineer and manager does not call a cooking range a stove. He knows better; and the trouble is with the uneducated manager and the ditto public. Ask any lady what she does the cooking with, and she will say the 'range,' of course; and she may qualify it with the words open or close. The close Leamington range looks like a 'stove;' but it is never so called. Why should we, therefore, when we apply gas to it, abolish a good and well-known name, and adopt another which already has a different meaning. Proper names exist in relation to all other fuels, and have existed for generations; and to make a jumble of these in relation to gas is a great mistake. Right terms exist, and are correctly used by the majority of educated people; and their example should certainly be followed."

NOTES.

The Roberts-Austen Pyrometer.

At the Cardiff meeting of the British Association, Professor Roberts-Austen exhibited and described, in the Chemical Section, his new self-recording pyrometer upon Le Chatelier's principle. In this instrument, pieces of pure platinum are made to connect thermally with pieces of platinum containing 10 per cent. of rhodium, and are placed in electrical circuit with a galvanometer of the reflecting mirror type. The spot of light from the mirror of this apparatus is caused to fall on a slit, before which a photographic plate passes at a given rate, by which means a curved line is traced, corresponding to the variations in temperature of the heated thermal junction. A similar thermal junction is maintained at a constant temperature by immersion in water; and the principle of the instrument depends upon the differing power of conducting electricity of the junction that is heated with that which is kept cold. The correctness of the indications are reported to be reliable up to the melting point of the platinum employed, within a range of 10 per cent. of possible error; which is accurate enough for most practical purposes. As a metallurgist, Professor Roberts-Austen has hitherto employed his pyrometer in the investigation of the thermic changes which take place during the cooling of metals and alloys; but the instrument should be equally available as a means of recording the alterations of temperature in a carbonizing retort, and in the flues of a retort-setting.

Field's Motive Power System.

Mr. Edward Field has brought out what he calls a new motive power system, intended to improve the efficiency of the steam-engine, regarded as a heat motor. Mr. Field proceeds upon the principle of admitting a small volume of steam into a large volume of heated air, and to use these mixed gases in the cylinder of the engine. The result has been, it is reported, that an engine so supplied has given out a greater useful effect than when driven by a volume of pure steam exceeding the volume of combined steam and air. Of course, it is admitted that the idea of mixing air with steam intended for use in a motor cylinder is not new; but it is apparently Mr. Field's claim that he has made a success of a proceeding that has hitherto been a failure. It is remarked in *Iron*, from which we draw our information on the subject, that the success of the system in practice depends upon the relative proportions of steam and heated air, and the temperature and dryness of the air. It is found that the best proportions for the mixture are about 1 of steam to 8 of heated air; and that the temperature should range between 400° and 500° Fahr. The discovery is said to resolve itself into this—"that with from 10 to 20 per cent. of the steam at present used in a given engine, Mr. Field can, by the admixture of the lesser volume of steam with heated air, do the same or a greater amount of work in that engine, with an economy of over 40 per cent." It is evident that if this position can be maintained, the supremacy of the steam-engine over the gas-engine, regarded as a heat motor, would be regained. In practice, the hot air is expected to be obtainable at little or no cost, by utilizing the waste heat which in an ordinary engine escapes into the atmosphere. In a trial of the system upon an 8-horse power portable engine, two mixing chambers were employed—one for each end of the steam cylinder. The chambers were alternately filled with dry hot air, to which the required volume of steam was added; the contents being alternately admitted to the engine cylinder first at one end and then at the other. Although the temperature of the air could not, for local reasons, be brought above 300° Fahr., the result of running the engine with steam and with the mixture of steam and air is reported to be that the latter showed an economy of 44 per cent. Our contemporary declares that Mr. Field's system of motive power is "the most far-reaching discovery of the age in steam engineering;" but we are inclined to suspend judgment in the matter until the plan has been more fairly tested.

The Rose Gaseous Fuel Plant.

A description of the Rose gaseous fuel producing process recently appeared in the *American Manufacturer*. A complete plant upon this system has been erected at the Colebrook furnaces, Lebanon (Penn.), by the National Heat and Power Company, of Philadelphia. Here the gas is used for roasting ore; but it is, of course, susceptible of other uses. As erected, a section of gas producing plant consists of three stumpy cupolas in a line, united at top by a horizontal drum of similar calibre, leading into a single superior vertical cupola. The coal—in this case bituminous but non-caking—is fed through valves into the producing cupolas, where it is carbonized before being fully gasified. As the gas is evolved from the three producers, it passes through the horizontal member of the apparatus to the bottom of the superior cupola, or dome, as it is called. Here the carbonic oxide meets with superheated steam at a high temperature, from which it takes oxygen, and, forming carbonic acid, liberates hydrogen. The hydrogen and carbonic acid (?) are carburetted a little further on in a cylinder which fills the centre of the same vessel, by Lima oil; and some hydrocarbon gas is formed. This cylinder is sufficiently heated by the hot gases passing around the outside of it in the dome. The cylinder is described as being full of gases passing up from the coal chambers; and the hydrocarbons are mixed with the gases as they pass up to the outlet at the top. The lighter portions of the oil are at once gasified and pass on with the coal gases to the top of the cylinder; while the heavier fall back again, meeting a continuous current of hot gas, and the portions not gasified thereby find their way back to the coke-bed below. The coke-bed thus plays an important part in fixing the gases, &c. All steam that has escaped decomposition is here broken up into hydrogen and carbonic oxide; while all the free carbonic acid unites with the carbon of the coke to become carbonic oxide. "The atomized hydrocarbon carried from the cylinders and the members of the marsh gas series that are formed, together with the carbonic oxide, react on each other as they pass over the red-hot surface of the coke, forming illuminants or heavy hydrocarbon gases." As with many other American gas processes, however, there is no available quantitative report on the performance of the plant.

Space-Saving Steam-Boilers.

According to an American contemporary, the special advantage of water-tube or sectional boilers in regard to economy of floor space was recently very strikingly exemplified in the case of a town steam-power plant belonging to Messrs. Carnegie, Phipps, and Co., of Pittsburgh. The firm had occasion to replace six Lancashire boilers, nominally of 35-horse power each, with more powerful steam generators. Stirling water-tube boilers were selected as meeting the requirements; and four of these, of 300-horse power each, or aggregating 1200-horse power in all, will be placed in the space previously occupied by the six double-flued boilers, which aggregated only 210-horse power. This shows a gain of practically 6 to 1 over the old boilers in floor space occupied for a given amount of power. The available space in this case was only a parallelogram of 31 feet by 45 feet. In this area there will be ample space for the erection of the new boiler plant in two batteries of two boilers each, facing each other, and fitted with mechanical stokers of some approved type. It is remarked that since gaseous firing has been so largely used in Pittsburgh mills, factory owners have insensibly encroached upon the space formerly appropriated for stoking and coal handling; so that when they find themselves compelled to resume the use of solid fuel, they are unable to spare the room previously required for shell boilers of the single or double flue types. This consideration is asserted to redound to the advantage of the sectional boiler. It must not be forgotten, however, that this form of boiler, although compact and safe, is wasteful of fuel; and it has to be seen whether, when steaming space is to be economized, boilers of the locomotive type are not preferable.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Sixth General Meeting of this Association was held on Wednesday last, in the Council Chamber, Cambridge. The PRESIDENT (Mr. J. Carter, of Lincoln) occupied the chair; and there was a good attendance of members and friends.

AN OFFICIAL WELCOME.

The PRESIDENT having introduced to the meeting the Mayor (Mr. F. C. Wace, M.A.) and the Chairman of the Gas Company (Mr. Alderman C. Balls, J.P.),

The MAYOR said he did not wish to intrude upon the business before the meeting; but he merely desired, in a few words, to give the Association a hearty welcome on behalf of the inhabitants of Cambridge. It was with very great pleasure indeed that he was able to comply with the request that was made to him for the use of the Council Chamber for the meeting. He was glad to see so large a gathering of members; and he hoped the meeting would prove a very successful one.

Alderman BALLS observed that it would ill become him to take up the time of the members in addressing them, seeing that they had a good deal of work before them of a most interesting character. He was pleased to have the opportunity of being present to listen to the papers and discussions; and he should regard it as quite an event in his life—having been connected with the Cambridge Gas Company for a great many years—in having assisted in welcoming to the town gentlemen who were so deeply interested in the gas industry as were the members of the Association.

The PRESIDENT said it was his pleasure to give voice to what he was quite certain was the general feeling of all the members—viz., their sense of obligation to the Mayor and Alderman Balls for being with them that morning. They were all sufficiently acquainted with municipal life to know how varied and pressing were the demands made upon gentlemen who were charged with the administration of local affairs; and for the Mayor and Alderman Balls to have found time to have come to the meeting to welcome the Association, was a matter of great gratification to each one present. On behalf of the members, he asked them to accept their best thanks for the kind words of welcome to which they had given expression.

MINUTES OF LAST MEETING.

The HON. SECRETARY and TREASURER (Mr. H. Wimhurst, of Sleaford) read the minutes of the meeting held at Lincoln in March last; and they were confirmed.

ELECTION OF NEW MEMBERS.

The following gentlemen were elected members of the Association: Mr. T. H. Martin, of Barnet; Mr. E. G. Smithard, of Chelmsford; Mr. H. Plowright, of Swaffham; Mr. J. G. Hawkins, of Spalding; and Mr. G. Cutmore, of Nayland.

Mr. WELLER then read the following paper, entitled

THE ECONOMICAL WORKING OF A SMALL GAS-WORKS.

Considering there are in England no less than ten different Associations of Gas Managers, where from forty to fifty papers a year are read, it is somewhat curious that there are only about three of the whole of that number which are on the subject of small gas-works. I hope, therefore, I may be excused for introducing it, and for expressing the hope that it will meet with a good discussion.

Assuming that the works have been built in the most convenient situation—viz., handy for carting coals, &c., by water, road, or rail, and also at the lowest possible level obtainable, with plenty of room for extensions—the first thing to be considered is storeage. At my works I have two holders 62 feet in diameter by 22 feet deep, each capable of containing about 62,000 cubic feet of gas. This, no doubt, would be thought by some to be rather large, considering that my annual make is only 14 millions. I find it, however, a source of great economy; and I am sure it doubly pays for the capital expended. Having this quantity of storeage space, I can, by filling the holders full when the consumption begins to increase, run a fortnight or three weeks before I have to put on another bed of retorts. This means a great saving in labour and fuel. It is, of course, the same when the demand is decreasing. For instance, on the 1st of March this year I filled the holders up to 101,000 cubic feet; and let out a bed of six retorts. In working through the month, we sometimes lost as much as 6000 cubic feet in 24 hours, and were sending out, on an average for the month, 2000 cubic feet per diem more than we were making. So that at the end we had only 39,000 cubic feet of gas in stock, when we began to hold our own. By this we saved upwards of 30 chaldrons of coke and one man's labour. Before passing from the subject of storeage, I may say that both our holders are fitted with circulating boilers, which I have found very convenient, especially last winter; for in the most severe weather, the water in the tank opposite the boiler was milk warm. I should strongly advise all who are not supplied with circulating boilers to have them before next winter. They cause little trouble; and the expense for fuel is slight.

I think the next important point to be considered is the most economical kind of retort-setting for small gas-works. Though we are not in a position to undertake experiments with regenerators or inclined retorts, I think in all smaller works a supply of secondary air might be tried. The plan on which my settings are worked [shown on a drawing exhibited] is very simple and inexpensive, as no special lumps or bricks are required, and they give much higher heats while consuming less fuel. I also prefer oval to any other kind of retorts, as they wear better than the ⌂ shape, and afford more heating surface than circular ones. I have four beds in my retort-house—two of five, and two of six retorts. The retorts in the former are 21 in. by 15 in., and 9 feet long. The four bottom retorts in the beds of six are the same size; but the two top ones in each bed are 14⅞ in. by 15 in., and 9 feet long. I had to make these smaller, to allow room for the side middle ascension-pipes. When building this stack, I had to put a bed of circular retorts in the coal-store adjoining the retort-house; and I have found it very convenient in the summer, when there is not enough work for the exhauster. At the same time it allows us to thoroughly clean, repair, and renew, ready for the coming season. The mouthpieces are all fitted with Morton's patent lids of the latest type.

A word about ascension-pipes. I think it a great mistake to have anything less than 6-inch pipes. I have none smaller, and should not like to have any. We are never troubled with stoppages—a happy condition which, no doubt, may be attributed to our having the pipes large enough, and a good 14-inch front wall. Hydraulic mains, I prefer in sections—one to a bed—fitted with a dip-regulating valve to each section, so that the dip can easily be regulated to each bed of retorts. My condensers are vertical—three stacks of 5-inch pipes, seven pipes in a stack, with a circular box top and bottom. But if I were making alterations, I should certainly have one of Morris and Cutler's, as I think they are much more effective.

There is a great deal of controversy as to the best kind of engine to be used in small gas-works. Some are in favour of gas, and others of steam engines. I must say I very much prefer the latter, as most of my pipes lie very "fleet;" and in frosty weather I am obliged to have a jet of steam continually running through them. I have also steam in the suction and delivery tar-pumps, as I pump the tar from the well, and deliver it into tanks about 30 yards from the pumps. I have also steam connections to the condensers, the scrubber and the inlet and outlet of the exhauster, the bye-pass of which would be a source of great trouble, as the pipe is only a 2-inch out of an 8-inch. This, I think, is a mistake. The bye-pass should be the same size as other connections—viz., 8 inches. It would be much more safe than with so small a throttle-valve. The exhauster is one of Beale's; and I have no trouble with it so long as the governor and bye-pass are kept clear.

I think a scrubber fitted with boards is more economical than one charged with coke or boulders; and it is very simple. The way in which I charged my scrubber with boards was this: I took a template of the inside, with the outlet-pipe in the centre, and had a number of ½-inch boards cut. I then cut the boards in lengths, put ½-inch pieces between them, put one layer one way and the next layer crosswise, and so on right up—forming ½-inch squares all over. These went on for a period of seven years without needing cleaning; whereas when the scrubber was charged with coke, it had to be cleaned out and renewed every two years. The same boards, after being cleaned, went in again, with the exception of a few broken ones. A word about the four-way valve at the bottom. Of course, there are four divisions, and each division is provided with drain-pipes to the seal-cup. Now, the great mistake with these drain-pipes is that they are much too small. I think they might carry the chambers the same size to form the seals, which would save a great deal of trouble, as most of the stoppages take place in this valve. I have a steam-tap at the bottom of the scrubber, and one about halfway up; so that I can clean out the scrubber in case of any tar getting in.

I have only three purifiers, 8 feet square; but I think of soon putting down another of the same size, for I do not consider a set of purifiers complete unless there are four. In my opinion, lime is better than oxide for small works, especially with only three purifiers. I use lime—three layers about 6 inches thick, and a top layer 9 inches thick. I tried to do away with two sets of grids, and laid the lime in double thickness; but I found this would not answer, as the lime in the centre of the layers was scarcely soiled, and did not purify much more than half the quantity of gas compared with the four tiers.

I consider that no works should be without a photometer and sulphur-testing apparatus; the Harcourt colour test being especially suited for small works, both for cheapness and simplicity. Governors, of course, must be arranged according to the levels of the district to be supplied, and the pressure kept as low as possible to prevent leakage.

Too much care cannot be given to mains and services. The former should be started large enough from the works, and continue the same size to the end of the district, instead of being reduced, as is often done. Of course, junctions to bye-roads may be smaller; but nothing less than 3-inch cast-iron pipe should be laid, unless for a special service, as the 2-inch pipe is liable to break where it is tapped. Indeed, I have found it broken in several places when I have been taking it up to lay larger; and I therefore make it a strict rule not to put in 2-inch pipes for mains. With respect to services, I think a manager ought to superintend every one that is laid, and not allow any man calling himself a gas-fitter to lay them. I do not permit anyone to touch anything on our side of the meter, and not even to fix the meter. I have all this done by my own men. I contract from the main to the burners, if consumers wish it, and let them select their own fittings from illustrated catalogues, as I consider this is more satisfactory to them.

The public lamps ought not to be passed by without a few words. In the first place, those of you who have not already done so should take out all the ¼-inch bends at the bottoms of the columns, and all the ¼-inch pipes underground. I suppose there are not many here who did not have a great deal of trouble with them last winter. I know we had, at Yarmouth; but we never allowed one to be out all night unless the pipe burst. There are several ways of clearing a frozen lamp. Some use spirits; but this takes half a night to clear half-a-dozen. We use a ¼-inch rod, sharpened at the point, and run it down into the bend; we then have what we call our "gun," which is a common plug with a gun-nipple tapped into the centre, put a little powder in the socket, screw it on to the top of the standpipe, put a percussion cap on the nipple, and give it a tap with the pliers. This is almost sure to clear it. It is not economy to work with too short a staff of lamplighters, as a great deal of unaccounted-for gas occurs with the public lamps when the lamplighter cannot get round in the time allowed him. One word about lamp-governors. I have tried a great many, but have not found any to equal those I am now using—viz., Hawkins and Barton's patent; and the same may be said of their burners, which I strongly recommend to all my consumers, and find they give great satisfaction.

I think every manager ought to do all he can to encourage the day consumption of gas for cooking, heating, and motive power. We have reduced the price 6d. per 1000 cubic feet for cooking purposes; and we fit up stoves and supply and fix meters free of charge.

With regard to general extensions, I think it is unnecessary expense, in a great many cases, to employ a consulting engineer; and I consider every manager ought to be able to design and superintend all alterations and improvements without any other help than that of a local architect and good tradesmen.

Discussion.

Mr. W. DUESBURY (Cambridge) observed that Mr. Weller's remarks with regard to the storeage of gas were very true. Plenty of storeage meant economy; and to be short of storeage meant—he would not say extravagance, but certainly waste. If they had to fire up beds of retorts just as the consumption varied, it was a very expensive proceeding. As to the question of main-laying, he would reiterate the author's statement that

3-inch pipes were quite small enough; and if every manager would come to the decision never to lay pipes of less diameter, he would find it would be to his advantage.

Mr. W. BARRATT (Grantham) remarked that there were several points in the paper which he did not think they would all agree with. With regard to the question of having photometers in small works, he did not consider it necessary to emphasize this as the author seemed to think. If they had photometers, it was necessary to have someone who could use them; and a great many men in small works were not capable of doing this. As to the size of gas-mains, if pipes of small diameter were put down, they would cause trouble in many ways; and what the author had said as to service-pipes, most of the members would endorse. He did not, however, exactly see the force of the "clearing-out business" explained by Mr. Weller; but, on the whole, the paper was calculated to do good.

Mr. B. GIBSON (Haverhill) inquired whether the author considered that purification with oxide and lime was better than with lime alone.

Mr. W. J. BEST (St. Ives) observed that the paper covered such a wide range of subjects that it was impossible to deal with them all. With reference, however, to the construction of the retort-furnaces, the question of a secondary air supply was perhaps a little fad of his own. If they had three fire-bars in the furnace, it would be found that the flame would go up the chimney; but if they took out one bar and had two, using a secondary air supply, the heat would all be retained in the furnace. The paper also advocated the use of large, instead of small, ascension-pipes to avoid trouble; but he (Mr. Best) thought, if the ascensions were kept a reasonable distance from the setting, they would not cause much difficulty. He disagreed with the author as to the way he used lime in the purifiers. In his own case, he now only employed one set of grids, and found he was able to do more work. As to the lime in the middle of Mr. Weller's purifiers not being soiled, this was owing to bad working; the gas no doubt simply passed up the sides of the boxes, instead of through the lime. In connection with the laying of cast-iron pipes, he might mention that he only used galvanized pipes for services; and he had noticed in cold weather that iron pipes seemed to assist the formation of naphthalene more than galvanized ones.

The PRESIDENT remarked that the President of The Gas Institute (Mr. W. A. Valon, of Ramsgate) had honoured them with his presence that day; and they would be pleased if he would take part in the discussions.

Mr. VALON said he had not prepared himself to say anything upon the paper, as he could not possibly know what it was going to contain; but he must say that the author had gone through his works from one end to the other in a way which showed that he himself was quite capable of managing a small gas-works. There were, however, two or three points upon which there might be a little difference of opinion. The first was that gas-works should always be at the lowest level obtainable. Now he did not quite agree with this—that was to say, it was not at all necessary to have the works at the lowest possible point, unless circumstances demanded it. Supposing they were depending upon their coal supply by rail, or had to cart the coal from the part where it was landed, then it was not at all essential that the works should be situated at a low point; indeed he (Mr. Valon) thought it an advantage to have the works on high ground. If the coal was brought by water, then it was necessary that the works should be at a low point; and this was the only excuse for having works so situated. If the works were at a high altitude, then the smell which naturally arose from them passed over the town. The gas could be easily led to the lowest part of the district by a trunk main from whatever height the works might be—the governor being fixed at the works the same as if they were at a low point. Of course, the additional pressure at the works would be something more than if they were on low ground. If they were at an altitude of 100 feet above the lowest part of the district, they would require a pressure of 10-10ths to drive gas to that part. But supposing they had the initial pressure at the lowest point, and the gas had to rise 100 feet, at that height they would have an increase of 10-10ths in the pressure. It would be seen by these remarks that his idea was that, excepting where they had water carriage, and other things being equal, the gas-works should be rather at a high point than a low one. Then, with regard to the storeage of gas, Mr. Weller had certainly erred on the right side in having two holders with his make of 14 million cubic feet. He agreed with him that large gasholders were economical; and it was always advisable to have a considerable margin of storeage on the works. With reference to the subject of purification, a question was asked as to whether oxide of iron was more economical than lime; but before this could be determined, it was necessary to know the conditions under which the materials were to be used. As to the use of lime in the purifiers, he did not think there should be any difficulty in passing gas through 18 to 24 inches of lime, if it was properly slacked and turned and put into the boxes. He thought Mr. Weller would find there was some fault in the way the lime was used, if he had any trouble in passing his gas through such a thin layer as he would call 8 to 12 inches. Towards the close of the paper, he saw Mr. Weller was very anxious that gas managers should do all they could to increase the quantity of gas burned in their districts. He (Mr. Valon) thought that this was the great object of them all—they wished to see the gas-works in their charge making as much gas as the district could consume. He might mention the great success that had followed the reduction of the periods in which gas accounts were rendered in the case of three or four works under his guidance, and especially at Ramsgate, where they had established weekly payments for gas—taking the payment in advance for (say) 500 cubic feet, and supplying the fittings free of cost. They charged a little more than the price to the ordinary consumer. The cost to the latter was at present 3s. 2d. per 1000 feet; and the prepayment consumers were charged 3s. 9d., or 4½d. per 100 cubic feet. This was about ½d. per 100 feet more than the general consumers paid; and was for interest on the outlay for the fittings and the meter. By this means they found that, during the last two years, they had tapped a class of consumers they could never have got in any other way. In the two years they had added above 500 consumers, who would never have used gas at all if they had not introduced this scheme, for the simple reason that there were many persons who were not able to pay the first £4 or £5 outlay (which would be the average amount a gas-fitter would charge) for fitting up a house. If the gas manager could relieve the occupants of small houses of this expense, and give them their fittings free of cost, simply asking them to pay weekly or fortnightly, it would be found they would have no difficulty in tapping a source of revenue which had never been opened up before. He was so thoroughly impressed with this, that he really believed, when it came to be worked out, they would find that the present system of three months' credit was a mistake; and the shorter rendering of accounts and the more frequent payment of them would lead to an increase of consumption and a reduction of bad debts.

The PRESIDENT remarked that he thought the members were under considerable obligation to Mr. Weller for bringing forward a paper on the subject of the working of small gas-works. They had a district which included a large number of small works; and to draw their attention to the principles that should guide them in conducting such concerns was extremely useful.

Mr. WELLER, in reply, said as to Mr. Barratt's observation that in many small works they had no one to use the photometer and to make the tests for sulphur, he thought they ought to bring up their young assistants to do work of that description. With respect to the question of purification, he specially mentioned in the paper that his purifiers were only 8 feet square. His idea was that, with oxide, they ought to have a catch purifier; and therefore they should have four boxes. As to the depth of the lime in the purifiers, he tried the experiment of taking two sets of the grids out, and putting in a double thickness of lime. With lime the average amount of gas dealt with in his ordinary working was about 3 million cubic feet for each purifier; but when he took out the two sets of grids, he could not deal with much more than half the quantity, and when the lime was removed, it was quite white in the centre. With reference to Mr. Valon's remarks, he (Mr. Weller) thought it was an understood thing that gas-works should always be at the lowest possible point. Where works were situated at a low level, one governor was generally found sufficient; but where works were located at a high point, three or four governors had to be used. If, however, they employed a trunk main as suggested by Mr. Valon, they could then possibly do away with two. With regard to Mr. Best's pet scheme of secondary air supply, he confessed that, when it was brought forward at the Ipswich meeting, he did not understand it. Before concluding, he strongly urged gas managers to have their holders fitted with circulating boilers.

The PRESIDENT said that the next item on the *agenda* was a paper by Mr. F. A. Ward, of Amersham, on the question of the rating of gas-works. They had received a telegram from that gentleman saying he regretted that unforeseen circumstances prevented him being present at the meeting; and therefore he (the President) would ask the Secretary to read the paper.

The SECRETARY read the paper, which was as follows:—

GAS-WORKS RATING.

The question of the assessment of gas-works is, to my mind, a very important one; and I may therefore be pardoned for venturing to call attention to it, although I may say at once that, personally, I have no special knowledge of the subject, and that it is only to learn the opinions of others, and to give the members an opportunity of expressing their views on the matter, which I feel sure is of considerable moment to us, that I offer a few remarks upon it.

In looking round, I find that the assessment question is one which has to some extent been neglected, although Mr. W. Carr, then of Halifax, read at the meeting of The Gas Institute in Manchester in 1885, a very able and comprehensive paper upon it,* in which he gave a valuable table showing the inequalities and total unfairness in a great many cases, of the present system of rating. Then, again, Mr. Norton H. Humphrys, in 1885, wrote a series of articles in the *Gas Engineer*, indicating the mode by which the rateable value of gas-works and plant is arrived at, and giving several cases showing its operation. Coming down to last year, we had published in the JOURNAL OF GAS LIGHTING a series of articles from the pen of Mr. Thomas

* See JOURNAL, Vol. XLV., p. 1170.

Newbigging, C.E., and since published in book form,* all tending to shed light upon the question. But to my mind the matter is still in almost complete chaos; consequently, there is room for a great deal to be done before the assessment of gas-works will be as easy to every intelligent person as reading a meter or making out a gas account, although I am positive, if it is looked at from all points fairly and squarely, there should be no more difficulty in it than in assessing an ordinary dwelling-house.

Now let us look for a few moments at the present mode of assessing gas-works—that which is generally adopted by professional valuers, and also by most gas engineers—a mode which, if we read the cases that are reported from time to time in the publications as the effect of its application, is anything but satisfactory, and is capable of being so pulled and twisted about by valuers and counsel as to make a very considerable difference in the results arrived at by opposite parties. Take for instance the case of the Peterborough Gas Company, of which one of our respected Past-Presidents, Mr. Barton, is the Engineer and Secretary.† Then we find a great difference between the amount arrived at by the valuers for the Assessment Committee and those for the Gas Company. The latter put the rateable value of the works and mains in the parish of Peterborough at about £2350; whereas the former valued them at about £3600. Thus we see what a wide difference there can be in the amount arrived at by two sets of valuers.

The mode by which the valuation of gas-works is ascertained by most valuers is briefly this: A hypothetical or imaginary tenant is supposed to be wanting to rent the works. Here I cannot do better than take from Mr. Newbigging's articles the following, which is an explanation of the mode:—

> In order to ascertain at what annual rent a tenant might reasonably be expected to take a gas undertaking—not on a lease for a term of years, but "from year to year"—it is necessary first to find what is the gross income arising from the hereditament; then the expenses consequent on the working. Then one being deducted from the other, there is left the net receipts. These net receipts constitute the fund out of which the landlord's rent and the tenant's profits are to be supplied. In other words, the net receipts are to be divided between the landlord and the tenant; and the next point to be settled is the tenant-occupier's share of the net receipts. This is done by fixing the amount of capital which he would require to enable him to work the concern. This would include a proportion of the year's expenditure; the value of the coals in stock, and other necessary stores of all kinds; the value of the chattels, such as tools and implements, office and laboratory furniture, and meters on hire; and, finally, a proportion of the annual rent which he agreed to pay. On the sum of the tenant's capital thus ascertained, interest at the rate of 5 per cent. is reckoned; then 10 per cent. for trade profits, and 2½ per cent. for risks and casualties—making 17½ per cent. This percentage, calculated on the tenant's capital, gives the tenant's share of the net receipts, and which, deducted from the same, leaves the "gross estimated rental" or "gross" value—that is, the yearly rent which the tenant would pay for the beneficial occupation and use of the hereditament. Then come the statutable deductions on the landlord's account for the imperceptible depreciation of the property. These consist of an annual amount assumed to be set aside, and invested at compound interest, for the purpose of the renewal or reproduction of the hereditament—the buildings, apparatus, plant, and main-pipes—at the end of a certain period answering to the average life of the whole; another amount for the renewal of the tenant's fixtures or chattels; and an allowance by way of insurance. The sum of these being deducted from the "gross estimated rental," leaves the "rateable value" of the whole.

Such is the, to my mind, very complicated mode used by most valuers, and one which I think is scarcely fair, as it seems that the best-managed works are thus most heavily rated, whereas a badly-managed works will get off lightly. I am at a loss to understand how a valuer would proceed, using the above method with regard to works making no profit at all, as a great many small gas-works are now doing—a condition to which a great many corporations are also tending.

The best method of dealing with this question is, in my opinion, that which Mr. Carr has placed before us, inasmuch as it would fall equally upon all works—whether they were paying high or low profits. Mr. Carr finds that, taking the average of a number of companies, the rates they pay are one-third of a penny per 1000 cubic feet of gas consumed per 1s. in the pound of rate levied. Objection to this mode has been made in several quarters, but not with any substantial ground. If we take the case of a company selling (say) 26 million cubic feet of gas per annum, and work it out by this rule, we shall find that for every 1s. rate they would pay £36 odd; and if this (if it were necessary) were multiplied by 20, it would give us the rateable value of the works—viz., about £720, which is a much more satisfactory figure than some works have at present attached to them. I think I may take it that this way would suit our esteemed friend Mr. Barton much better than that under which he is rated at present; for if we take 70 million cubic feet as the sale at Peterborough (I do not know the exact figures, but this is near enough for an approximate calculation), we shall find that this works out to about £97 for every 1s. of rate levied, or a rateable value of £1940, instead of £3600 as at present. It has been suggested that this method of dealing with the question would affect gas companies very unequally, as in some towns the rates are twice or three times the amount they are in others; and therefore the works situated in the heavily-rated places would have to bear more than in the more lightly-rated towns. This is purely a local matter, and not one which has anything to do with the general principle of this mode of rating. Take, for instance, the case of my own town and one situated three miles from it. With me, the rates are not more than 2s. 6d. in the pound—sometimes less; whereas in the other case they are 8s. or 9s. in the pound.

There is also another way of arriving at the rateable value of gas-works, and one which has been adopted in several instances—viz., taking a certain percentage (say, 4 per cent.) of the capital employed by the company. This mode would perhaps answer very well in certain cases, and possibly some companies would be fairly assessed by it. But I think that in the majority it would be a failure, as some companies are, not through any fault of their own, burdened with a very large capital, and consequently would be assessed very heavily, while others are the reverse, and therefore would get off lightly in regard to the assessment. But the only mode which commends itself to my mind is the one which Mr. Carr has shown us; and until a better one is presented, I should be prepared to stand by it, as I think it fairly meets all cases. No doubt, in dealing with individual cases, faults would be found in the system; but they would be small compared with the other methods mentioned.

In conclusion, I wish it to be clearly understood that, in writing these few remarks, I am not animated with a desire to do injustice to anyone, but am trying to gain the opinion of members of the Association in this important matter.

Discussion.

Mr. BARTON said he quite agreed with the writer of the paper that the present system of valuing gas-works was not at all satisfactory. They had had some little experience with it at Peterborough; and, he was sorry to say, the appeal went against the Company, and brought up their assessment something like 75 per cent., and increased the rates from about 2d. per 1000 cubic feet of gas sold up to 4d. The existing method of assessing gas-works was, to his mind, a tax on management, because the valuers took the profit that was made. If they had a gas-works which had a large capital, they would be compelled to make a considerable amount of profit, comparatively speaking, to pay the dividend. Take his own case, he had a capital of nearly £80,000, and a make of below 80 million cubic feet. To pay dividend on the capital and interest on the bond debt, they had to make a profit of about £5600 a year; and this was taken, with certain deductions, as the rental that a tenant would have to pay for the works—the result being that they had to pay on an assessment of £3600, with a gross profit of about £5600. With a rate of between 4s. and 5s. in the pound, a tax was thus imposed on the gas sold of nearly 4d. per 1000 cubic feet. This he did not consider at all satisfactory, because if they had smaller works with less capital, they could produce the same quantity of gas, and would not require to make so much profit; but as they had large-sized works to meet the demands of a growing town, with mains well laid and of large size, in order to pay the maximum dividend they had to make more profit, and were taxed on that. He thought that, if they had some system of taxing gas-works on the quantity of gas made, or the quantity sold, or on the number of tons of coal carbonized, they would then get more equality. He knew that sometimes the price of gas at Peterborough (which was now 3s. 2d. and 3s. 4d. per 1000 cubic feet) was compared with the charge in neighbouring towns; and the people who made these comparisons did not take into account the different circumstances connected with the works, but jumped to the conclusion that the Company were charging more for gas than they ought to do. They did not trouble themselves to know the details; and on this ground, he did not think it was fair that one gas-works should be assessed so much higher than another. Of course, the gas consumers had to pay; but at the same time, it was a hardship on the companies. At Peterborough they were nearly at the top of the tree as regarded the rates and taxes; and he was sorry to say they had no means of reducing them. He should be glad if some method could be devised whereby the assessment could be based on a proper calculation; so that all gas-works throughout the United Kingdom could be put on a fair and satisfactory footing.

Mr. BEST said he did not think this question of the assessment of gas-works need trouble gas companies very much, as the money came out of the pockets of the consumers. In his own case, he had a grievance. In the parish where his works were situated, they were not assessed so high as in the one where the mains were.

Mr. BARTON: The assessment is based on the amount of revenue derived from the different parishes.

Mr. BARRATT asked what was going to be evolved out of the present discussion. Paper after paper had been read on the subject of the rating of gas-works, of which perhaps one of the best and most intelligent was that which was contributed by Mr. Carr some years ago at a meeting of The Gas Institute. Was it not time now that some action was taken by the different Associations to bring this matter to an issue? With regard to Mr. Best's remarks, he should not himself like to say that this was a matter which need not trouble gas companies, seeing that the consumers had to pay. This was just where it did matter. It was the consumers who complained; and anything that could be done to reduce the price of gas would confer a benefit not only upon them, but upon the companies themselves. He had himself suffered very nearly as much as his friend Mr. Barton had done. He had tried to ascertain the principle upon

* "The Valuation of Gas-Works for Assessment," with an Appendix of Decided Cases. London: Walter King.

† See JOURNAL, Vol. LIII., p. 295.

which the valuer assessed his works; but this he was unable to do, and consequently they had to fight him. He thought it would be wise if a resolution could be passed to the effect that the Presidents of the different District Associations should meet, and bring together their different views, and see whether they could not devise some proper method of assessing gas-works. This could be brought before the Government; and if possible—and personally he did not think it was impossible—some law on the subject should be enacted. He had no objection to paying his taxes, provided they were assessed in a legitimate manner, and all had to pay according to a given scale. They were in duty bound, in the interest of the consumers, to make a move in this matter.

Mr. VALON said he quite agreed with Mr. Barratt's remarks; and even before that gentleman commenced speaking, he had made a memorandum in these words: "It cannot be altered without parliamentary interference." To argue the injustice or inequality of rating was quite outside their province. What they wanted to do, in the first instance, was, as Mr. Barratt suggested, to come to some intelligent arrangement among themselves that would recommend itself to the authorities who had to legislate on these matters. By going in the proper channel, and throwing themselves open to examination, he thought there would be little difficulty in convincing the authorities that the present mode of assessing gas and water works, and many other undertakings, was very inequitable, and bore very hardly, not on the companies alone, but on a portion of the public. If it affected evenly the whole of the public, they would have nothing to say, because everyone would have to bear an equal burden. It was because it only affected (say) one-half of the public that it was their duty, as representing that part, to see they were fairly dealt with. The reader of the paper and the subsequent speakers were perfectly right in saying that, under present conditions, it was quite impossible to arrive at the true value of the works to be assessed. The profit earned had no reference especially to the investment made. The two things were quite at variance—the profit earned and the value of the hereditament. He certainly thought it was wasting time to attempt to discuss the matter until they had taken the proper steps in order to get it altered.

The PRESIDENT observed that, although they could not alter the system of which they complained, there was not the least reason why gentlemen who had anything to say on the subject should not take part in the discussion.

Mr. BARRATT said he should like to take the feeling of the meeting on the question. Unless they combined, they would get nothing from the movement; and he would suggest that a member should propose a resolution to the effect that the Presidents and Secretaries of the various Associations should meet together, and see whether they could not hit upon a plan by which they could move the Legislature.

The PRESIDENT said he was not quite clear as to whether a resolution of that kind would be in order at this meeting. However, he wished to say a few words upon the subject. It seemed to him that there was a great deal more to be said for the principle of the hypothetical tenant than had been said so far. All assessments were based on the rental of the property; and assuming that they could, by the adoption of well-known principles, find what would be a fair and reasonable rental for premises to be assessed, then it appeared to him that they had a fair starting-point, and it would not be a difficult matter to arrive at what would be a proper sum for those works to be assessed at. He was thinking over the matter a few days previously; and it occurred to him whether they could not adopt the principle of making the assessment at per 1000 cubic feet of gas. But this was open to the same objection as the present system; and in the minds of some, it would be a tax upon good management and successful carbonization. Then if they based the assessment upon the amount of capital expended, how would they deal with those works which had provided for extensions for years to come; and where the actual amount of business done yearly was not at all in accord with the amount of capital which had been laid out, and upon which profit had to be made. The whole question seemed to be full of difficulty; and the most practical solution of it which occurred to his mind was that they should have some Court appointed, the members of which should fully understand all matters connected with the gas industry; and let them decide what should be a fair amount of burden for a gas-works to carry. He was sorry Mr. Ward was not present to reply to the discussion, but was sure he would be much interested when he read the report of the debate to which his paper had given rise.

THE STOREAGE OF COAL.

Mr. C. E. JONES (Chesterfield) then opened a discussion on "The Storeage of Coal, viewed with regard to the Combination of the Mining Industries to the Detriment of the Gas Industry." He said that this subject was a very important one, and one to which they, as gas managers, would do well to specially direct their attention, having regard to what was likely to happen in the future. The total area of the coal measures of the United Kingdom was about 6000 square miles, or 4,050,000 acres; this being exclusive of the south-eastern division of England, where coal had recently been found. In 1873, the output of coal was 128,680,131 tons; and in 1890, according to the Government returns, 181,614,288 tons—an increase in eighteen years of 52,934,157 tons, or nearly 30 per cent. (29·20 per cent.), and over the previous year of 4,697,564 tons. The number of mines in 1873 was 3938; and in 1890, 3409—being a decrease of 529, or 13·43 per cent. It would thus be seen that, while the number of mines had decreased, the output had largely increased; and this arose from the fact that small mines were unprofitable to work, and the large mines had increased their power of output. In 1890, the number of male persons employed underground was 531,670; and including the pit top, sidings, and coke ovens in and about the mines, with 5890 females, they had as the total number of persons employed 674,434. The coal industry, it would be observed, was a very important one in this country—employing as it did nearly three-quarters of a million of people, and providing the backbone of the gas industry. The occupation of a miner was now twice as safe as it was formerly. In 1872 there was one death in every 233 persons employed; and in 1890 one in every 543. The general average of coal raised for every fatal accident was 226,023 tons, or 178,227 tons per death resulting from accident. These figures showed a remarkable increase on what took place the first year the Coal Mines Regulation Acts came into operation. Of the 181,614,288 tons of coal raised, he calculated—and he thought he was taking a very low estimate indeed—that more than 12,000,000 tons were used in the manufacture of gas, or about one-fifteenth of the entire output. The number of gas-works in the United Kingdom might be placed roughly at 600, of which 65 per cent. belonged to private enterprise, and 35 per cent. to local authorities. What he wished to direct particular attention to was the combination on the part of the miners and their employers, with the view of forcing up the price of coal. This took place some two years ago, with very disastrous results to the gas companies. He might say that, within a comparatively short period, the price of coal had been advanced all round by 4s. per ton; and he thought he might say that last year and a portion of the previous year, it was considerably higher than that. Now a penny per ton on twelve million tons of coal came to £50,000 a year, which had to be taken out of the gas profits. A shilling a ton amounted to £600,000; and 4s., to £2,400,000 a year. During the combination of miners and coal-owners, no less a sum than 10 millions had been taken out of the gas industry. How was the 4s. per ton divided? He believed that 1s. 4d. went to the collier, and 2s. 8d. to the coal-owners, or 40 per cent. to the one and 60 per cent. to the other. These figures might be taken as reliable, as he was conversant with the prices being paid for getting coal. Now this advance had hitherto been sustained without (excepting in a few instances) increasing the price of gas; but they could not go on like this for ever. His desire was that every gentleman present at the meeting should give his personal experience in this question, in order that they might convince the coal-owners and colliers that the gas industry was not an El-Dorado. With tar falling and sulphate receding, and a rise in the price of nearly every article used in gas-works, this must in the end tell unmistakably, and very injuriously indeed, upon the future of their industry. They all rejoiced most heartily when they heard of the amelioration of the material and social condition of the working classes. The colliers undoubtedly deserved all they had obtained; but having received an advance of 40 per cent., they ought to be satisfied. There were, however, rumours of strikes, other combinations, shortening of the hours of labour, and a reduction of the output; and these things it would be well for gas managers to take note of, and, if possible, to meet the circumstances under which they found themselves. Coal was no doubt an indispensable national article; but what was to become of kindred trades if these combinations were to lead to a prohibitory price? Already there was a shrinkage in some of the trades of this country—notably in the iron trade; and as history in all ages had a peculiar "knack" of repeating itself, bad times would come upon the country again if they had to depend upon the coal-owners for their assistance. Gas managers could not now be sure of getting their coal regularly from the contractors; and they were always making stereotyped excuses. Some three days a week was now about the time a collier took to earn what he used to get in six days. His object was to have less to do, and yet earn the same amount of money. The latest fad was for an eight-hour day. But how was an eight-hour day to have legislative enactment. If it had, it must be applied alike to all the country—to doctors, railway men, fishermen, sailors, hospital nurses, and others. The working man of this country had done more than any other people to encourage the importation of foreign labour, by being led by the nose by faddists. With these evils staring them in the face, gas managers must conduct their affairs economically; and in order to get peace and comfort, it was absolutely necessary that they should have a store of raw material always at hand, and a storeage largely in excess of what they used to consider necessary. The six weeks' storeage of the old orthodox times was now no longer applicable; and he would be a rash man who would not make provision for a larger quantity than this. He thought that, if the present state of things continued, they would have to provide for one-third of the total year's consumption of coal, which would mean an increase in cost if it was purchased from a contractor. This would mean an increase in the cost of the manufacture of gas; and this would mean, following the corollary, an increase in the price of gas. But if they attempted to increase the price, they

would have an enlightened public up in arms immediately. One word of warning to the coal-owners. Owing to the high price of cannel, it had almost been superseded in the South of England as an enricher of gas; and bituminous coal would follow, unless great care was exercised on the part of the coal-owners and the leaders of the colliers. The advent of oil as an enricher of coal gas and also of water gas was enough, he thought, to cause the upward movement with regard to coal to pause. It should be a matter of serious consideration for the coal-owner as to how far he could squeeze the gas industry, or how far he would encourage the importation of oil and the manufacture of water gas. That this would injure the coal industry went without saying. He hoped these few words of warning would be taken up by those to whom they were addressed, and that nothing more would be heard of attempts to force up the price of coal. In the face of interruptions in the railway and canal traffic, strikes, holidays, accidents, frosts, &c., which increased the responsibility of the gas manager, it was absolutely necessary that he should at once secure ample storeage under cover.

Mr. Duesbury said there was no doubt about it that the time had come when gas managers unfortunately had to get in larger stocks of coal than they had been in the habit of doing; and this entailed additional expense. He hoped the price of coal would recede somewhat. If it did not, it would be a very serious matter; and the price of gas would necessarily have to go up. Mr. Jones had referred to the use of oil by the London Gas Companies for enriching their gas in the place of cannel; and if the price was not reduced, other gas companies would have to take similar steps.

Mr. J. T. Jolliffe (Ipswich) said he did not take quite such a pessimist view as Mr. Jones as to the combination of coal-owners and miners, nor did he think it was necessary to have a stock of coal so large as had been mentioned. He thought it would be better to pay a little more for coal than to spend a considerable amount of money on coal-stores, and with the risk of firing and other incidental troubles involved in having a large stock of coal. At the same time he thought it was desirable to have a fairly good supply of coal in hand. This year coal had been bought much cheaper than last year; but he believed that, whatever the price of it might be, they would have to depend in future very largely upon the state of the trade of the country as a whole, and more especially upon the state of the iron trade. Many present knew that for years the coal-owners did not earn a penny of profit; and this was not a healthy state of things. He did not say they were to make a fabulous sum of money; but certainly gas companies who had year after year paid maximum dividends without much trouble, now that dark days had come upon them, should not raise the hue and cry of absolute despair. If necessary, they should advance the price of gas to pay the dividends; but this should only be done as a last alternative.

Mr. A. Mitchell (Bury St. Edmunds) said that he should like to say a few words upon this particular phase of the question: A great many of the members were managers of comparatively small works, and used all inland coal. The experience of most of them was, he believed, that they had too little storeage room; and they would find it of considerable advantage if they could store a great deal more coal than they were now able to do. They were guided to some extent in what they did by their directors; and if the latter would only allow their managers to buy more coal earlier in the season, and have more storeage in the winter, it would benefit all concerned. He was afraid many small works had not even six weeks' storeage, while they ought to have at least twelve. There was no reason why small works should take in but very little coal from the middle of November until February; and the coal they had to use would then be dry and much cleaner.

Mr. J. W. Helps (Croydon), in reply to an invitation from the President, said that this coal-supply question had not affected his Company so far to any great extent, because they happened to have a contract which had carried them on to the end of last June; and now that the price had gone down, they had been able to get a contract at a figure a little above the old one. Unfortunately, they were placed in the position of having storeage room for only 6000 to 7000 tons of coal, which merely represented about five weeks' supply. Though as a rule he was not favourable to middlemen, they did not buy their coal direct from the owner; but they had a contractor who, in the event of their not being able to get coal from the pit which they contracted for, could give them either inland or sea-borne coal. He rather agreed with the remarks made by Mr. Jolliffe, that it was not necessary to go to the extent of four months' storeage, as proposed by Mr. Jones; but he was of opinion that two months' storeage should be the minimum. As to the question touched upon by Mr. Mitchell with regard to the delivery of coal during the winter, his remarks were perfectly right. In his (Mr. Helps's) own case, when he had his coal-store quite full, he merely asked the contractors not to stop their deliveries, but rather that the amount of coal coming in should be about sufficient to carry them on from day to day without decreasing the storeage they already had. It seemed to him that if the gas companies promised to take a larger amount of coal during the summer, the coal-owners would make a reduction in price (say) up to the end of October. He believed, however, it was the case with many contractors that, if they knew a company's stores were full, and they (the contractors) happened to be pushed in the winter, they would take advantage of it, so that the company would really be in no better position than if they had not stored coal in the summer. As to the use of oil for enriching gas, there was no doubt that the tendency, at any rate in and around London, was to do away with cannel. He had himself given the subject some study; and, on his advice at their last meeting, his Directors had given an order for a set of apparatus which, he hoped, would supersede the use of cannel.

Mr. Wimhurst suggested that, as there were two representatives of colliery-owners present—Mr. Taylor and Mr. Fincken—it would be interesting to hear them on the subject under discussion.

Mr. Taylor said that, for about eight or nine years previous to two years ago, colliery-owners actually lost on their transactions; but during the past two years, they had made money, and he was very glad they had. He hoped that these sudden changes would bring about some kind of system, whereby both gas companies and colliery-owners would receive a fair amount of dividend on the capital they had invested in their concerns. He thought that if a Committee were appointed on behalf of colliery-owners and gas managers, they could come to some kind of arrangement by which the latter would take the coal as it was drawn out of the pits. He certainly could not see why gas companies should expect the colliers to work only two days a week in the summer, and six-and-a-half in the winter. He had had contracts where he had to deliver 2½ per cent. in the months of May, June, and July, and had been called upon to deliver 15 per cent. in December, January, and February; and from his experience of 22 years, he found that gas managers always pressed him more in December than in any other month.

Mr. Fincken said Mr. Jones had stated that there had been a rise in the price of gas coal of 4s. per ton, which represented a total sum to the gas industry of £2,400,000; and of the 4s., he asserted that 1s. 4d. had gone to the men, and 2s. 8d. to the masters. His (the speaker's) experience had been with one or two of the Silkstone collieries; but he entirely failed to see where this 2s. 8d. had been obtained. Up to the year 1888, collieries were actually losing from 8d. to 9d. per ton of coal; and instead of the 2s. 8d. referred to by Mr. Jones, the figure should now only be 8d. As to the difficulties with the men, Mr. Jones lived in a colliery district; and he was in a position to appreciate the trouble they had had with them as well as he (Mr. Fincken) was, especially with the younger men. He could not at all see the reason why this question should have arisen now; but if the subject of increased storeage had been brought forward two years ago, he could well have understood it, as, of course, it was now well known that prices were falling. Then Mr. Jones said there was a combination of the colliery-owners and the men; but there was no such thing—in fact, they were "at daggers drawn." If gas-works owners had lost the 4s. per ton on their coal, and were still able to pay their dividends, this showed that, in past years, they must have had very rosy times indeed.

The President said that he questioned the wisdom of attaching such great importance to momentary combinations of either coal-owners or their men. No doubt, these arrangements were productive of a good deal of inconvenience to those who happened to be in the market when they were in full swing; but in the very nature of things, they did not last long, and would soon right themselves. He was quite with Mr. Mitchell when he said that it would pay gas companies far better to spend a little more capital on storeage, so that they could put coal under cover, than to be content to go on year after year with limited storeage, and be exposed to the danger of waiting for supplies, and having to go into the market to buy coal at something like panic prices. He was of opinion that if they provided for six weeks' maximum storeage, they would be in tolerably easy circumstances, and would get through some extraordinary winters without any difficulty at all.

Mr. Jones, in reply, said there was no doubt the coal-owners had recently mended their ways somewhat; but they had given them no guarantee for the future, and therefore it was just as well that gas managers should keep their eyes upon them. Although situated right in a coal-field, he had been within his last 24 hours' supply, owing to strikes, the congestion of the railways, and the inability of the masters to compel the men to work. As to paying colliery-owners for coal rather than erect additional storeage room, he thought this was a very visionary notion, because they could not make the men work; and the output was regulated more by the whims of the men than by the wills of the masters. He thought it was generally recognized that the coal storeage of gas-works was insufficient, taking the country all round; and he did not think that three or four months' storeage was at all outrageous. Besides there was the important point that coal stored in the summer was much better for gas-making purposes than coal delivered in the wet and snow of the winter months. As to taking the coal as it was obtained from the pits, he pointed out that it was not drawn from them in anything like regularity all the year round; but there was something in the idea as they were more likely to get the coal in a dry and good condition. He quite admitted that, for some eight or nine years, colliery-owners were losing 8d. or 9d. per ton; and he agreed that collieries were not so remunerative as they might be. But, on the other hand, there were also scores of gas companies which, for many years, never paid any dividend at all to their shareholders. It was asserted that there

was no combination between the coal-owners and the men. Of course there was not; but it could not be denied that there was a tacit understanding. As to the profits of gas companies, these were not at all enormous; and they had to publish a statement of their accounts, which was overhauled by Government auditors. The colliery-owners were under no obligation to do this; and they now made 20, 30, and, in one instance he knew of, over 200 per cent. In conclusion, he repeated that six weeks' storeage was utterly insufficient; and it should be quite as much as he had advocated in his opening remarks.

On the motion of Mr. R. J. SHARMAN (Wisbech), seconded by Mr. C. J. WRIGHT (Saffron Walden), a vote of thanks was passed to the readers of the papers and to Mr. Jones.

ELECTION OF OFFICE-BEARERS.

Mr. BARRATT moved, and Mr. BEST seconded, the appointment of Mr. C. E. Jones as President for the ensuing year.

This having been unanimously carried,

Mr. Duesbury was elected Vice-President, on the motion of Mr. BARTON, seconded by Mr. YORSTON.

On the proposition of Mr. MITCHELL, seconded by Mr. WELLER, Mr. Wimhurst was re-appointed Hon. Secretary and Treasurer; and the Auditors (Messrs. Weller and Yorston) were also re-elected, on the motion of Mr. BEST, seconded by Mr. C. W. GRIMWOOD (Sudbury).

Each gentleman having acknowledged the honour conferred upon him,

Mr. WELLER observed that they were in the happy position of having a balance of £25 in hand; and he had much pleasure in proposing that a honorarium of ten guineas be presented to their Secretary as a slight recompense for the great trouble he had taken in furthering the interests of the Association.

Mr. YORSTON having seconded the motion, it at once received the hearty approval of the members.

Mr. WIMHURST, in returning thanks for this kind recognition of his services, mentioned that, when the Association commenced, they had only 24 members, but now there were 53.

Mr. W. J. Carpenter (Yarmouth) and Mr. J. H. Troughton (Newmarket) were elected members of the Committee in place of Messrs. Jones and Grimwood, who retired by rotation.

PLACE OF NEXT MEETING.

The question of the selection of a town at which to hold the next meeting gave rise to a little discussion; and eventually it was decided that Sleaford should be visited.

VOTES OF THANKS.

A vote of thanks having been passed to the Mayor of Cambridge for allowing the Association the use of the Council Chamber for the meeting,

Mr. A. DRAGE (East Dereham) moved a resolution acknowledging the services of the Auditors and the Committee during the past year.

Mr. DUESBURY seconded the motion, which was carried.

A similar compliment was then paid to the President, on the motion of Mr. C. DIXON (Horncastle), seconded by Mr. WRIGHT.

The PRESIDENT briefly responded; and this concluded the meeting.

The remainder of the afternoon was spent by the members and friends in visiting the Senate House, and King's, Clare, Trinity, St. John's, and Jesus Colleges; the Mayor and Mr. Duesbury kindly acting as guides. The gas-works were also inspected; and the day's proceedings were brought to a close by a dinner at Ye Olde Castel Hotel.

Electric Lighting for Portsmouth.—The Portsmouth Town Council have, on the recommendation of the Electric Lighting Committee, adopted the scheme propounded by Mr. J. N. Shoolbred for supplying electricity in the borough for public and private lighting, and have agreed to make application to the Local Government Board for their sanction to the borrowing of £60,000 for the purpose of carrying it out. An epitome of Mr. Shoolbred's report was given in our last issue.

Reduction in the Price of Gas at Leighton Buzzard.—A correspondent writes: Gas consumers in this town will learn with satisfaction, that owing to a slight reduction in the price of coal, and the increased economy in production, estimated to take place in consequence of the alterations at present going on at the Leighton Gas-Works, the Directors have resolved, on and after Oct. 1, to reduce the price 4d. per 1000 cubic feet, bringing the net cost down to 3s. 8d.

The Water Supply of Newport (Mon.).—The members of the Newport Corporation last Tuesday visited Wentwood (a portion of the famous border forest), whence it is proposed to obtain a supply of water for developing the eastern side of the borough. The proposed supply from the springs at the Severn Tunnel has been rejected on account of the quality of the water; and the Corporation have now turned to the supply at Wentwood as the most suitable. Powers to obtain water from this source were obtained by the Corporation, when they decided to purchase the Newport Water-Works Company's undertaking, three or four years since. There is abundance of water; and the catchment area is held to be unexceptionable. But the construction of one or two reservoirs would be necessary to store the water. The obtaining of a supply from Wentwood was one of the projects of the old Company. The visit was a very successful one; and it is understood that the members were greatly impressed with the desirability of getting the supply.

REGISTER OF PATENTS.

Gas-Engines.—Vermand, P. J., of Port de Brest, France. No. 13,019; Aug. 19, 1890. [8d.]

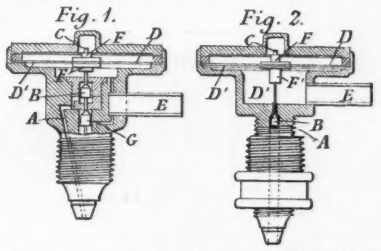
This invention relates to atmospheric gas-engines, and is characterized principally by an arrangement of parts admitting of their being employed either as pumps for elevating or extinguishing fires or as compressors for hydraulic apparatus, or for hydraulic propellers.

The engine consists essentially of three cylinders, the pistons of which are connected together in an invariable manner. The cylinders may be arranged either in line (the pistons being in this case fixed upon the same rod), or parallel, or side by side—the pistons being in the latter case coupled, by a cross piece or bar provided with suitable guides, to direct or control its movements. A certain quantity of air compressed to two or three kilogrammes per square centimetre is introduced, after having been passed through a gasoline or other carburettor, into the "expansion cylinder." Upon the closing of the slide, an electric spark is kindled in the interior of this cylinder; the mixture explodes; and the piston is moved a considerable distance—the gas expanding so as to be reduced to a very low pressure. During this time the two other cylinders—one of which compresses the air necessary for the operation of the apparatus, and the other which forms the pump or propeller—are both open to admission; and consequently they offer no resistance of any moment to the forward movement of the motor. After the piston of the expansion cylinder has arrived at the extremity of its travel or stroke (a point which is moreover variable), it is returned to its normal or original position under the action of the atmospheric pressure; and, in this movement, it also carries back the other pistons, which are then in the position for compressing. At a predetermined point in the travel or stroke, a slide-valve—or some equivalent arrangements—opens communication between the cylinder of the pump and the suction or supply tank; and from this instant, the pump offers no resistance to the movement, or opens communication between the two sides of the piston with the hydraulic propeller. When the gases in the expansion cylinder have expanded to the pressure of the atmosphere, a slide places the interior of this cylinder in communication with the external atmosphere. These arrangements are for the purpose of permitting the return of the pistons to the bottom of their stroke, and the expulsion of the burnt or consumed gases from the expansion cylinder. The latter has, however, at the end of the return stroke, an advance of the opening of the admission, so as to cushion it, or obviate any shock which might otherwise occur.

Regulators for High-Pressure Gas.—Suiter, A., of Forest Hill, S.E. No. 13,652; Aug. 30, 1890. [6d.]

This invention relates to regulators or governors for high-pressure gas, consisting of an equilibrium valve opening inwards, and connected direct on to a diaphragm without levers, screws, spiral springs, or weights of any kind.

The balance valve and seating of the equilibrium valve are loose or separate, and capable of being fixed after the centre spindle is in place. In cases where an exactly uniform pressure of gas given off is not required, one valve only is employed, made so minute in diameter that it requires very little power to overcome the pressure of the gas in the storeage cylinder. The valves open inwards; and in both cases the centre valve-spindle is connected direct on to a disc or diaphragm, the springing of which by the pressure of the gas given off closes the valve without the intervention of any levers, screws, &c.



Figs. 1 and 2 are elevations (part in section) of two different kinds of high-pressure gas-regulators constructed according to this invention.

A is a passage for high-pressure gas; B is a valve connected direct on to the diaphragm D, by the valve-spindle C; and E is a low-pressure gas outlet. Upon high-pressure gas being admitted to the passage A, it finds its way by the valve B to the chamber D^1 under the diaphragm D. The outlet E being closed by the flexible tube or stop-cock, the pressure rises until the diaphragm D springs or buckles; thus closing the valve B, and preventing more gas entering. The pressure of the gas in the chamber D^1, given off by the outlet E, is regulated by the clamping nuts F F^1 being so adjusted that the diaphragm D must spring or buckle more or less before closing the valve B.

In cases where an exactly uniform pressure of gas is required to be given off at the outlet E, the valve G (fig. 1) is added to balance the valve B, so that there shall not be a varying force tending to close the valve (according to the pressure in the vessel) against the antagonistic springing of the diaphragm. The antagonistic springing of the diaphragm is thus constant, and closes the valve B when the pressure has risen to the predetermined extent in the chamber D^1, no matter what the pressure of gas in the vessel may be.

Gas-Engines.—Roots, J., of Mottingham, Kent. No. 14,549; Sept. 16, 1890. [8d.]

The patentee proposes that during the suction stroke (for about one-half the stroke) gas and air shall be drawn together into the cylinder, forming the explosive charge; then, for the remainder of the suction stroke, air only is drawn into the cylinder, either by a different or the same valve. During about half the in (or compression) stroke, the air

is displaced or ejected from the cylinder either into a separate chamber or into the mixing chamber, from whence it may at the next suction stroke be again drawn into the cylinder with gas, and form the next charge. The charge left in the cylinder after the displacement is then compressed in the remaining half stroke and fired—having a double expansion—and then exhausted in the usual manner. Or the reverse of this action may occur—air being drawn into the cylinder during the first half of the stroke, and an explosive charge in the second half; then the air is first displaced in the instroke, leaving the charge behind the piston to be compressed as before. The valve by which the air is ejected may be in the middle of the stroke.

A modification of this arrangement for effecting double expansion may be combined with the division of the charge into two portions, described in patent No. 9310 of 1888, as follows: The second explosion chamber is preferably placed at the side of the cylinder in horizontal engines with the mixing chamber bolted at the end of it. The admission-valve spindle passes through the neck to the outside of the mixing chamber, instead of through its centre. A lever, by means of a cam on the exhaust-valve shaft, opens the valve at the proper time, and retains it open during nearly half the instroke; while about half the cylinder contents are ejected from the cylinder to the second explosion chamber, and on to the mixing chamber. When combustion occurs, the charge is expanded to nearly double the volume of the original contents, but to more than double the volume of gas and air fired, as during the in or exhaust stroke the exhaust-valve is preferably closed before the stroke end by about one-sixth. Thus the portion ejected is drawn through, and returns through, the second explosion chamber; and the combination is effected in a very simple manner, and with an economical result. The exhaust-valve is opened by a cam and lever, in the usual manner, preferably fitted in the cover. The gas-valve is controlled by a lever, which has attached to it a spiral spring, the other end of which is connected with a fixed stud; so that, when in the central or straight line position, the lever, by the spring tension, will move in either direction at the slightest touch of the adjustable pins on the rod fixed to, and raised by, the centrifugal ball governor. The spring may also be fitted to a toothed quadrant acting in the same way, the teeth of which gear into a pinion fixed to the screw-spindle of the gas-valve.

For ignition, a small chamber is placed part way in, or attached to, the external tube or channel used for ignition, and kept red hot by an atmospheric burner. The chamber is lined with asbestos fibre, slag wool, or other incombustible material, to ignite the charge. The gas-tubing ignition-pipe is heated, and dipped into a solution of silicate of soda to prolong its life. The inner part may consist of a carbon tube in the clearance space or in a recess in the cover. The cover and clearance space may be lined with carbon, and the tube formed by a hole or channel bored in the carbon disc lining the cover.

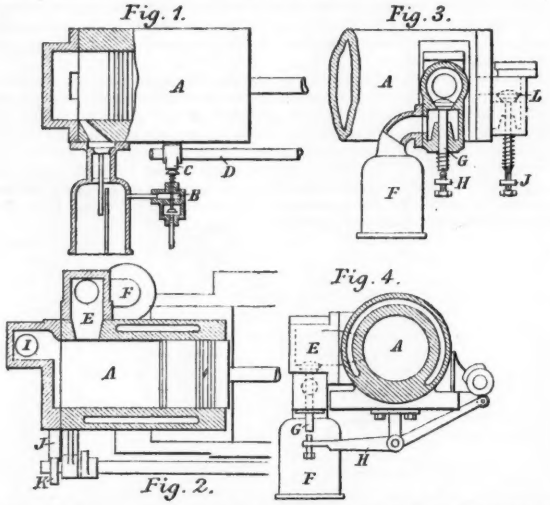


Fig. 1 is a part sectional elevation of all that is necessary to illustrate the first part of the invention; A being the cylinder, into which a combustible charge of gas and air are drawn by the out-movement of the piston for about one-half its stroke—the gas-valve B being kept open by means of a cam C, of the required peripheral length, fixed upon the shaft D. During the remainder of the stroke, the cam allows the gas-valve to close, cutting off the supply; so that air only is drawn into the cylinder, which, upon the return stroke of the piston, is displaced either into the mixing chamber or through the exhaust-valve opened for the purpose. The combustible charge left in the cylinder after the air displacement is then compressed and fired; but it is expanded to twice its former volume—giving, therefore, double expansion—after which it is exhausted in the usual manner.

Figs. 2, 3, and 4 represent sectional plan, part sectional side elevation, and part sectional end elevation respectively of an engine constructed according to the second part of the invention; being a modification of the arrangement, whereby double expansion combined with the division of the charge in two portions is effected, as described in patent No. 9310 of 1888.

Referring to fig. 2, the second explosion chamber E is placed preferably at the side of the cylinder A, with the mixing chamber F attached to it (as shown in fig. 3), with the admission-valve spindle G passing through the lower neck or junction box to the outside. It is opened by a tapped lever H at the proper time and retained open; so that about half of the cylinder contents may be displaced into the second explosive chamber E past the valve G into the mixing chamber F during part of the in or compression stroke of the piston. The remainder of the stroke of the piston compresses the charge when it is fired, first in the clearance and then in the second explosion chamber; the charge being expanded during the working stroke to more than double the volume of gas and air fired, for the patentee prefers the exhaust-valve I to close at about one-sixth before the stroke ends. The exhaust-valve is operated by means of the lever J and cam K. The portion of the charge displaced into the mixing chamber is drawn into the cylinder A, by way of the second explosion chamber E, upon the next suction stroke.

Lubricators for Gas-Engines.—Guest, G., of Hackney Road, E., No. 6433; April 15, 1891. [6d.]

This arrangement consists of a glass sight tube, fitted at the top with two tubes, one for conveying the gas under pressure from the exhauster to the top of the reservoir, and the other for conveying the oil from the bottom of the reservoir to drop at the point of view in the glass tube. The gas passes from the exhauster up through the glass tube, through one tube to the top of the reservoir, and displaces the oil down through the tube at the bottom of the reservoir. It is regulated by a valve fitted between the reservoir and the top of the sight of the glass; the oil dropping down the same tube as conveys the gas from the exhauster. The only fitting necessary to the part to be lubricated is a socket tap to receive the lubricator for refilling; the bottom tap being closed when the plug is removed at the top of the reservoir.

APPLICATIONS FOR LETTERS PATENT.

15,078.—Williams, H., "Improvements in gas and similar motor engines." Sept. 7.

15,104.—Furness, J. G., "Avoidance of shadow from gas-fittings by a new style of globe and position of the holder, to be called 'Furness's patent shadowless gas attachment.'" Sept. 7.

15,130.—Bartlett, J., and Williams, G., "Improvements in incandescent gas-lamps." Sept. 7.

15,249.—Lake, W. R., "Improvements relating to the manufacture of ammonia and gas." A communication from A. Hennin. Sept. 8.

15,286.—The Incandescent Gas-Light Company, Limited, "An improved manufacture of incandescence bodies." A communication from C. Auer Von Welsbach. Sept. 9.

15,306.—The Manchester Oxygen (Brins' Patent) Company, Limited, and Jackson, W. M., "Improvements in the manufacture of oxygen." Sept. 10.

15,311.—Sykes, M. L., "Improvements in valves, taps, and water gauges." Sept. 10.

15,372.—Bovagnet, E. A. T., "An engine worked by vapour and compressed gas." Sept. 10.

15,390.—Williams, H., "Improvements in apparatus for use in the manufacture of illuminating gas." Sept. 11.

15,433.—Armour, L. H., "Improvements in or connected with the manufacture of illuminating or heating gas." Sept. 11.

15,469.—Fourness, H., "Improvements in the manufacture and storeage of illuminating and heating gas." Sept. 12.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

The Bristol Gas Bill.

Sir,—The Journal of the 14th of July last contained some remarks upon the Bristol Gas Bill (not very complimentary to the Committee, the promoters, or the professional men engaged upon it), and which I would have replied to at the time, but as I was agent for the Bill, and it had not received the Royal Assent, I was precluded from doing so. The Bill having now become an Act, and been submitted to the shareholders of the Company and met with their approval, I need have no hesitation in giving such explanation as I think those remarks require. I hope, therefore, that you will allow me space in your next issue for this purpose.

Speaking of the Committee, you say: "The promoters were permitted to have their own way, from the almost contemptuous complaisance of the honourable members who adjudicated upon it." I was present during the whole time, and cannot but think that this is an entire misrepresentation of what actually did occur. At the commencement of the proceedings, the Committee paid great attention to the opening speech of Counsel, and the evidence given by the Chairman of the Company; and having heard these, they showed by their subsequent questions that they clearly understood what the objects of the Bill really were, and were at a loss to understand why the Bill was opposed, as, to their view, it must have appeared that it would be as beneficial to the consumers as to the Company, and which in truth it really was. As regards the opposition, the remarks might to some extent apply, as the evidence given by the opponents was more applicable to a general opposition than to the special objects of the Bill; and probably it was for this reason that the Committee gave so little attention to it.

The objects of the Bill were as follows: The Company was incorporated by an Act passed in 1853, and constituted by an amalgamation of two Companies which for some time previously had been competing with each other in the same district—a very common proceeding at that time. By the Act of Incorporation the expenditure of the two Companies up to that time was fixed as the original capital of the United Company, with a dividend of 10 per cent.; but power was given by the same Act to raise additional capital at 10 per cent. (the reduced rate of 7 per cent. for new capital not having been then introduced), subject to its being sold by auction in the City of Bristol, and the premiums being applied to capital purposes, the same as the nominal amount, but without dividend. Probably this was the first instance in which such a provision was ever imposed upon any company. All the capital created by the amalgamated Company had, therefore, been raised in that way; and as the Company had paid a dividend of 10 per cent. the greater part of the time, the premiums amounted to nearly as much as the nominal amount—the two being very close upon £500,000, which as a matter of course had all been expended upon the undertaking.

The Gas-Works Clauses Act, 1847, which is incorporated in the

Company's Special Act, authorizes all gas companies to create a reserve fund equal to one-tenth of their nominal capital—that is to say, "the amount paid up;" and their Special Act authorizes them to borrow for capital purposes an amount equal to one-fourth of their nominal capital. Under these regulations, a company with a capital of half-a-million expended upon its undertaking would be entitled to a reserve fund of £50,000, and power to borrow £125,000; but in this case, as only one-half of the amount had been raised as nominal capital (the other half being premium, although both had been expended on the undertaking), the reserve fund instead of being equal to one-tenth part of the entire expenditure, as the Act of 1847 provided, was limited to the one-tenth part of the half only, and the power to borrow limited in the same way.

It is impossible to suppose that this was the intention of the Act of 1853. Obviously it was only an oversight, not foreseen at the time, but which disclosed itself when the Act was put into operation; and the object of the Bill was simply to amend these provisions without interfering with any of the other obligations of the Company.

The remedy at first proposed was to reckon the premiums as part of the nominal capital, and authorize the Company to create a reserve fund and to borrow in the proportion the Acts allowed—as had been done in several other cases lately. But as the nominal capital and the premiums were so nearly equal in amount, and both had been duly expended upon the undertaking, after due consideration it was deemed better to put the nominal capital and premiums together, and convert the two into ordinary capital, by doubling the amount of the present capital. This would enable the Company to create a reserve fund and to borrow, without any other provision, upon the entire amount; and the doubling of the capital—notwithstanding the remarks in the JOURNAL—was nothing more than this.

It was explained to the Committee that if every £100 of the 10 per cent. authorized capital were allowed to be issued as £200 at 5 per cent., it would probably realize a larger sum of money to expend upon the undertaking than £100 at 10 per cent. It would thus be a benefit to the consumer; but, as there would be no more dividend to pay upon it, it could not benefit the present shareholders. It was also explained that the dividend allowed to gas companies generally upon new capital had for some time past been only 7 per cent.; while the dividend allowed to the Bristol Company was 10 per cent. Consequently the consumers in the district complained of were charged 10 per cent., while other towns were only charged 7 per cent., although as a matter of fact the dividend paid upon the money actually invested in the undertaking—shares and premium together—has from its commencement to the present time been only at the rate of £5 1s. 6d. per cent.

Doubling the capital gave the promoters a slightly larger reserve fund than they would have under the ordinary regulations; but this it was explained was no prejudice to the consumers, as, without a substantial reserve fund, the price of gas would of necessity have to be raised whenever there was any substantial increase of expenditure. The Committees in both Houses, after hearing these explanations, made a short case of it, and gave the promoters all they asked.

Doubling the capital was only applicable in this particular case. It could not be adopted as a general principle, as there is not another gas company in the United Kingdom where the nominal capital and premium are so nearly the same in amount; and it was only on this account that the doubling was proposed. In a few years more, at the rate of expenditure now going on, there may be many such companies; but this, it must be remembered, had been going on at Bristol ever since the year 1853.

At the present time, when interest upon capital is being reduced in all directions, and the sales of new capital by auction are reducing the rates to one common level of 5 per cent., it would be wise for gas companies to consider whether it might not be better to take all new capital at 5 per cent., instead of 7 per cent. (so that the public may see for themselves what they are actually paying), than to maintain the present fictitiously high dividends by means of premiums, and lead the public to suppose they are being unfairly dealt with. These fictitiously high dividends are seriously misleading the public as to gas companies' profits.

It is a folly to suppose that the general consumers understand premiums. When they see the high premiums paid for gas shares, they imagine they are premiums upon old shares, which realize these high figures because of the high dividends that have hitherto been paid upon them. They do not suppose that the premiums are for the benefit of the consumer. There are but few, very few, men who will trouble themselves to understand anything outside their own occupation.

W. LIVESEY.

76, Palace Chambers, Westminster, S.W.
Sept. 16, 1891.

The Coal Resources of England.

SIR,—I am obliged by your insertion of my letter of the 10th inst. in this week's JOURNAL, and for your comments thereon, by which it appears that you think it is necessary to expend the portion of coal *capital* consisting of our export, in order to enable us to pay our *current* expenses for corn and other foreign supplies.

This is a gloomy prospect; and as regards corn this capital expended forms a bounty, cheapening it in competition with, and to the injury of, our home producers.

As regards goods from India and Australia, which you instance, I am of opinion that our Colonies and British possessions should be exempt from any duty imposed on foreign countries.

Sept. 16, 1891.

A GAS DIRECTOR.

Manchester Sewage Scheme.—Yesterday week, a deputation from the Glasgow Corporation visited Manchester for the purpose of making inquiries respecting the new sewage scheme which is now being carried out. They made a careful inspection of the plans; and afterwards visited various portions of the work. It is estimated that the total cost will be £450,000, of which about £200,000 has already been paid to the contractors. From 1700 to 1800 men are engaged on the works at the present time.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Ordinary General Meeting of this Company was held last Tuesday—Sir FREDERICK MAPPIN, Bart., M.P., in the chair.

The LAW CLERK (Mr. W. Wake) read the notice convening the meeting; and the Directors' report and the balance-sheet for the half year ending June 30 last were taken as read.

The CHAIRMAN, in moving the adoption of the report, said that everyone must admit that gas companies had had a very difficult time during the past half year. The large advance in the price of coal, the higher wages, and the shorter hours of labour had compelled the majority of gas companies to resort to their reserve funds in order to pay the statutory dividends. To this the Sheffield Company were not an exception; but he held that these reserves were intended by Parliament to be so used. Many companies had also been compelled to raise the price which they charged for gas. The Chairman of the Liverpool Gas Company, at the recent meeting of the shareholders, in referring to comments made upon their advance of 4d. per 1000 cubic feet, mentioned a number of other companies who had also advanced their price from 2d. to 4d. This condition of affairs was not confined to private companies; but corporations had had the same experience. In their own case they had to take £5100 from the balance brought forward to enable them to pay the statutory dividend; leaving £6755 to be carried to the present half-year's accounts. The reserve fund was at its maximum—£78,618; and the Directors, in the present position of the Company, had not discussed, or even referred to, any increase in the price of gas. He did not think they had any of them any fear of being compelled to make an advance. They had paid the large sum of £11,168 more for coals than during the corresponding period of last year. Stokers' wages were £1209 more; the amount spent out of revenue for relaying mains and service-pipes was £1977 more; and the repairs to works cost an additional £379. The total amount expended in repairs and alterations was very large, being £22,782; but the Directors had no hesitation in incurring the expenditure, because they were satisfied that, by so doing, better results would be obtained from the labour and materials which they used. A favourable feature in the report was the largely increased sale of gas, amounting to £5784. The sale of residuals had also increased; the extra receipts from them, with smaller sums for sundries, being £2316. There was one thing which he did not look upon as satisfactory. They found themselves possessed of 3500 tons of coal more than they expected to have in stock. He believed they had paid for this being carbonized; but unfortunately there was the coal without gas being produced from it. When he learned of this, he felt it his duty to personally inquire; and he had weighed a truck of coal that was being moved when he was in one of the retort-houses. The weight was then found to be correct. He had the same truck put upon another weighing-machine, when it was discovered to be 28 lbs. short. This was not satisfactory either to himself or the Directors generally; and he trusted it would not occur in the future. Whose fault it was, he was not prepared to say. He did not charge the gas stokers with having anything to do with it; for, had it been placed before their retorts, he had no doubt the foremen would have seen that it was carbonized. They carbonized 91,142 tons of coal; being 5692 tons more than in the corresponding six months of 1890. The increased cost of £11,168 was not entirely due to the higher prices of fuel, because £3269 of that amount was spent to provide the extra supply of gas. There was also a difference in the leakage, which was not satisfactory. Instead of having only 7·63 per cent., or 66,506,000 cubic feet, as last year, they had 88,033,000 cubic feet of gas, or 9·27 per cent., which had not been accounted for. Their station meters indicated that 10,414 cubic feet of gas was made per ton of coals; and it was difficult to believe there should have been such a discrepancy. But after looking at the figures with reference to other places, he thought the leakage was not so excessive. The Bristol Gas Company had made 781,374,000 cubic feet of gas, and had 78,143,000 feet unaccounted for. He hoped this and any other shortcomings of their officials would be remedied in the near future. The Chairman proceeded to refer to the complaints that had been made as to the quality of the gas; remarking that he was perfectly satisfied that they complied with the legal requirements in this respect. Not only were there the official tests, but the tests of their own Chemist, who was independent of all the officials except the Directors. Their Engineer might make a test at any time for himself; and they had superintendents and other officers who made tests daily at both works. During the six months ending June 30, there had been a total of 876 tests made, which was about the usual number. The average test came out at 15·97 candles, which was equal to 17·47 candles, measured by the London standard burner. The number of meters they had in use was above 48,000; there having been an increase of 1003 during the past twelve months. This was satisfactory progress, which he thought the price and the quality of their gas entitled them to look for. The average price they obtained during the past year was 2s. 0·84d. per 1000 feet for the whole quantity sold. During last winter there was so much pressure upon the works that the Directors became convinced that they must have some new retorts beyond those already fitted; and they gave up the scheme for the present of constructing a large gasholder at Neepsend, and decided to go forward with the Grimesthorpe works. The expenditure on capital account would no doubt be very considerable; and upon those who had charge of the work, a large responsibility would rest in seeing that the best modes of manufacturing gas were adopted. Comments had been made on the inability of the Company to supply a sufficient quantity of gas to the consumers. He admitted at the last half-yearly meeting the difficulties which existed; but he believed that those would be remedied, and that they would not occur again for some time to come—at all events in the same direction. But no one who had had any experience believed that gas companies could be managed in a perfect manner by anybody, no matter what his ability. He thought the Company's officials did their duty, and intended to do so as far as possible. Sir Frederick then quoted from the remarks made by the Chairman of the Nottingham Corporation Gas Committee, in

moving the adoption of the annual report at the recent meeting of the Council (*ante*, p. 449); and also referred to the results of the working of the Crystal Palace Gas Company during the past half year. Under all the circumstances, he thought it might be said that the report and accounts in their own case were satisfactory. The only other subject to which he alluded was the building of some houses at their Neepsend works. He had only that morning heard that some friction had been occasioned with the workmen by this course. The object of erecting the houses was this: A large sum of money had just been spent in stoking machinery at Neepsend; and knowing the difficulties which sometimes arose in introducing machinery, and the objection to it which working men often felt, without any ground for it, he thought that, in case their stokers should refuse to work these machines, the Company ought to be in a position to provide other men who would work them. There had been no reason, however, to bring the houses into use; for their stokers had readily accepted the machines, and were only too delighted to use them instead of stoking with the shovel and scoop.

Mr. H. HUTCHINSON seconded the motion, which was carried.

The usual resolution as to dividends was agreed to, on the motion of the CHAIRMAN, seconded by Mr. WILSON MAPPIN.

The retiring Directors—Messrs. J. W. Harrison, W. G. Blake, and R. A. Hadfield—having been re-elected,

Alderman W. SMITH said he had a resolution to move, which was of an exceptional character; but when the facts were properly laid before the shareholders, he felt sure it would obtain their support. The resolution was that, as from June 30 last, the remuneration of the elected Directors be, until altered by some subsequent general meeting of the Company, after the rate of £1500 per annum, such sum to be divided among the Directors for the time being, at such times and in such manner as they shall from time to time determine. The remuneration of the Directors ever since the incorporation of the present Company in 1855 had been limited by Act of Parliament, so that under no circumstances could it exceed £900 per annum. The capital at that time was £264,984; and at the present time it was £792,411—in other words, the capital might be said to have trebled since that period. As Sheffield men, they all knew how the population of the town had grown. For some years the increase had been going on at the rate of 5000 a year. That was 50,000 in ten years; so that, as the Company had existed for 36 years, there would be an increase in population during that period of 170,000 or 180,000. All this must necessarily have led to an enormous increase in the labour and attention required from the Directors, and in the responsibility thrown upon them. They had made many enlargements and additions to the works; they had reduced from time to time the price of gas; and the quality of the article obtained no one could justly complain of. They had also maintained the dividends at the highest rate which the Act of Parliament allowed. But during the whole of the time until last year, there was no power on the part of the shareholders to increase the Directors' allowance. Last year an Order was obtained, under which the Company could spend money in enlarging their works; and also increase the remuneration of the Directors to a maximum, which was not in any year to exceed £2000. He asked the shareholders to increase it only to £1500; and this sounded reasonable in view of the increased capital, the extended population, and the extra responsibility which had arisen. The Directors had always conducted the affairs of the Company in a manner perfectly satisfactory to the shareholders.

Mr. B. CARTLEDGE seconded the motion, which was agreed to.

The CHAIRMAN thanked the shareholders on behalf of himself and co-Directors for the handsome way in which they had received the proposal. They had acted wisely in so doing, because they ought not only to look at the present time, but the future. He could not always be the Chairman; and he thought they should have it arranged so that whoever succeeded him should have a remuneration adequate to his services. Unless they were prepared to give that remuneration, he did not think they could expect a man of considerable ability, who might not have the very large stake in the concern that he himself had, to undertake the position.

Dr. SHERA then proposed a vote of thanks to the Chairman, the Directors, and the Law Clerk (Mr. Wake).

Mr. J. WILSON seconded the proposition, and added the name of the General Manager (Mr. Hanbury Thomas), whom, he said, they were all glad to see back again fully restored to health.

Dr. SHERA accepted Mr. Wilson's suggestion to add the name of the General Manager, and said, with the consent of his seconder, he also desired to add the name of the Engineer (Mr. F. W. Stevenson).

The resolution, as altered, was unanimously adopted.

The CHAIRMAN, in acknowledging the compliment, remarked that the Directors felt they were supported by able and efficient officers.

The proceedings then terminated.

FALMOUTH GAS COMPANY.

The Annual Meeting of this Company was held the week before last—under the presidency of Mr. R. M. Tweedy—when the Directors reported that "the affairs of the Company continued to prosper; and, under the able management of Mr. Buckley, the result of the year's work has proved satisfactory, whilst the buildings and plant have been maintained in thoroughly good order. Some of the purifiers having become defective and additional purifying power being required (in consequence of a large increase in the quantity of gas made), it has been decided to erect a new set of four large purifiers, to accommodate which an alteration in their position was necessary. The cost of the same with additions to the building, will amount to about £1000, a considerable portion of which will have to be paid from the profits of the year. It is gratifying to find that the quantity of gas made and sold per ton of coal carbonized compares favourably with former years. The leakage has also been reduced to 5¾ per cent. During the year the offices have been removed to more commodious premises, and a showroom opened for the exhibition and sale of the latest improvements in gas lights, fires, stoves, and cookers. In consequence of the decrease in the price of coal, and the present efficient state of the works, it is with great satisfaction the Directors are able to state that they have decided to reduce the price of gas from 4s. 2d. to 3s. 9d. per 1000 feet, from June 30 last—the price that was charged prior to the passing of the Act of Parliament." The report concluded with a recommendation of a dividend at the rate of 10 per cent. per annum—the same as the interim dividend paid in February.

The CHAIRMAN, in proposing the adoption of the report, said it was the first presented by the new Company; and they had found that their recent Act worked very well indeed. It conferred more powers as to the public lighting of the town than they possessed as a limited liability company; and they found the local authorities met them with the greatest courtesy, and he hoped they would remain on the best of terms. The affairs of the Company had progressed very favourably. The plant was in good order; and certain improvements had been made which were considered necessary. Among other things, the old purifiers, which had been in use for 20 years, had been replaced by four new ones; and at the same time they thought it advisable to make provision for the use of oxide of iron for purifying purposes, instead of lime. He also referred to the leakage, which had been brought down from 8·40 per cent. last year to 5·74 per cent. during the year now under review—the smallest percentage since the works were started.

The report having been adopted and the dividend declared, the Directors, in accordance with the Act of Parliament, all retired; but, being eligible offered themselves for re-election, and were re-appointed, as were also the retiring Auditors.

Mr. GROSE remarking on the proposal to form a syndicate to light the town with electricity, asked if there was any disposition on the part of the Directors to supply the power, supposing the scheme should come into operation, or what steps the Board would take.

The CHAIRMAN said they withdrew the electric lighting powers from their Act, by advice, on its 'presentation to Parliament; and the Directors did not propose to do anything in the matter. Personally he was of opinion that, in towns where the electric light was in use, the supply of gas was generally increased.

A vote of thanks to the Chairman terminated the meeting.

KILMARNOCK CORPORATION GAS ACCOUNTS.

The report of the Kilmarnock Corporation gas-supply undertaking for the year 1890-91 (submitted at the last meeting of the Town Council) shows that there was a gross revenue of £13,076, and a gross expenditure of £11,054; or a profit of £2021 on the year's operations. With the balance of £9715 from the previous year's accounts, the total surplus amounted to £11,737. Out of this sum there was provided for the sinking fund £4440, which was brought up by other items to £4463; and consequently a net balance of £7274 was left to be carried to next year's accounts. Notwithstanding the reduction made in the price of gas a year ago—from 3s. 6½d. to 3s. 4d. per 1000 cubic feet—the revenue last year compared with the previous one showed an increase amounting to £56. During the year mortgage debentures to the amount of £4600 were repaid; making the total sum repaid under this head during the past five years £11,700. This account stood at the close of the year at £24,825; whereas in 1876 it was £44,450—the largest sum borrowed. The expenditure on coal during the year was £4371, against £4057 in the preceding year; or an increase of £674, which was due alike to the increased demand for gas and to the enhanced price of the coal purchased. The quantity of coal carbonized was 7500 tons; realizing 9500 cubic feet of gas per ton—the total make being 71,268,100 cubic feet. In the preceding year 7032 tons of coal were carbonized, and the total yield was 67,270,000 cubic feet of gas, or an average of 9565 cubic feet per ton. The average price per ton of coal during the past year was 12s. 7¼d.; whereas in the year 1889-90, it was 11s. 6¼d. So that there was an average increase of 1s. 1d. per ton in the price of the coal used. The gas sold was 63,422,928 cubic feet; as against 59,373,780 cubic feet in the year 1889-90. So that the increase was 4,049,148 feet, or equal to 6·38 per cent. The unaccounted-for gas was equal to nearly 11 per cent., as compared with 11·73 per cent. in the previous year. Wages paid amounted to £2153, or £201 more than in 1889-90. Much of this increase was owing to the greater quantity of coals carbonized; but some of it was due to the extra work in the erection of the new purifiers. It was estimated at the beginning of the year that the wages account would reach £2165 (actually £2153). For meters the year's expenditure amounted to £474, against £310 in the preceding year. The rise of £164 was caused by the increasing number of new consumers, together with the demand for dry meters for use with cooking and heating stoves. The increase in the number of gas consumers during the past few years has been about 300 per annum, or 6 per cent. Sulphate of ammonia was produced to the amount of nearly 81 tons, for which £899 was realized; and the amount of tar made was 112,435 gallons, realizing £938—together, £1837. An average yield of 15 gallons of tar per ton of coal carbonized was obtained; and 24·18 lbs. of sulphate of ammonia were made per ton of coal. For gas sold there was an income of £10,570, and the rental from meters was £283. These sums, along with the amounts realized from sales of refuse lime, coke, tar, &c., and rents, gave a gross revenue of £13,076, as already mentioned. The liabilities at the close of the financial year amounted to £32,461, including £24,825 as mortgage debentures, the balance of £7274 which is carried to profit and loss account, and sundry other items. On the assets side of the balance-sheet, the gas-works are set down as of the value of £28,236; and with the other items—the stock of material on hand, outstanding accounts, stock of stoves, and cash in bank on deposit, current, and sinking fund accounts, &c.—a total of £32,481 is again made out. By way of supplement to the report proper, the Manager (Mr. Fairweather) gives a minute and interesting analysis of the balance-sheet.

The Hadlow Gas-Works, with the whole of the fixed and loose plant, was recently offered for public competition; but £690 being the highest bid, the property was withdrawn.

ELECTRIC LIGHTING FOR CORK.

The Gas Company's Application for a Provisional Order.

The notice which the Cork Gas Consumers' Company have given of their intention to apply to the Board of Trade for a Provisional Order to empower them to supply electricity, came before the Cork Town Council last Friday week; the Company having made an application for their consent. A report on the subject was submitted by the Town Clerk, in which he suggested the advisability of referring the application to a Committee to report on, after a conference with the Directors of the Company. He was aware that an impression prevailed among some members of Council and the general public that a gas company ought not to obtain this concession. The public interests as to supply, &c., would be just as safe as they would be by any other body, if not better guarded; and, in his opinion, the Gas Company could afford to give the supply better and more economically than anyone else.

Mr. LYNCH, one of the Directors of the Company, remarked that the supply of electricity could be more cheaply and advantageously carried out by the Gas Company than by any other body. Mr. Denny Lane, the Secretary of the Gas Company, had made a study of the subject; and he would state to the Corporation the reasons which they hoped would induce the Council to give their assent to the application.

Mr. DENNY LANE observed that if the electric light could be supplied by any company without loss, his Directors thought their Company could do so, as the same Board and staff, with an electrician and an assistant, could carry out the gas and electric lighting in the city; whereas, if a separate company supplied electric lighting, a considerable outlay would be necessary for the purpose, while an expensive staff would have to be maintained. If the electricity were to be produced at the gas-works, the Company would have no extra rent to pay; and if, as was more probable, the electricity would have to be generated in some central station, they could work that at a small cost. It was their intention to divide the expenses of working the two systems *pro rata*, so that if the rental from the electric light amounted to one-tenth of the gas-rental (which would be a liberal allowance), the result would be that the electric lighting would be only charged one-tenth of the common expenses, and the gas lighting nine-tenths; while if another company carried on the electric lighting, they would have to bear all the expenses which the Gas Company would divide between the two systems. If the electric light were largely used, the Company might be enabled to reduce the price of gas to the consumers. There were two difficulties that an electric company would have to contend against in Cork. The first was the early closing hours in the large establishments, by which there would be no consumption in the summer, and but very little in the winter; and then many people in the higher walks of life lived away from the centre of the city, where it would be impossible to supply the electric light except at an exorbitant price. There was another embarrassment, and that was that several of the streets were liable to be flooded; and in these streets it would be necessary to lay down copper cables covered with insulation of india-rubber, and a sheeting of iron outside that. The cheapest way to supply electricity in Cork would be to have a small station in the centre of the city where the current would be generated with gas-engines; and if this were so, the Gas Company could supply electricity more cheaply than any other company. He would remind the Corporation that the Company had paid more than £2000 in rates; and he thought they should get the preference. If, after all, the Corporation intended to take up electric lighting themselves, his Directors would not offer any opposition. They felt certain, however, that it would not be a profitable undertaking for the Corporation; and that the Gas Company could do the work cheaper than anyone else.

A brief discussion followed, and eventually the application was referred to the Electric Lighting Committee.

ELECTRIC LIGHTING FOR DUBLIN.

At the Meeting of the Dublin City Council yesterday week—Alderman KERNAN presiding—a recommendation of a Special Committee was under discussion, to the effect that an application be made to the Board of Trade for a Provisional Order to replace the Licence of May 3, 1889, empowering the Corporation to supply electricity for public purposes, and that of June 24, 1890, enabling them to supply electricity for private purposes, the Order to embrace both these Licences and their objects. The report of the Committee which contained this recommendation stated that a letter had been received from Mr. T. A. Mooney, the Secretary of the Local Government Board for Ireland, which, after mentioning that the Board had had under consideration the term within which the loan of £37,000 proposed by the Corporation for electric lighting should be repaid, read as follows: "The Board's Chief Engineering Inspector (Mr. Cotton) has received a statement from the City Engineer, from which it appears that a sum of £4200 will be spent at the central station on buildings, and £32,800 on machinery, &c. The Board, having very carefully considered the matter, are of opinion that a loan for the machinery, &c., should not be for a longer term than the duration of the Licence—that is, to the 3rd of May, 1896, but that a loan of £4200 may be granted for 25 years. The Board accordingly sanction the loans on these terms; but they desire at the same time to intimate that, if the Corporation obtain a Provisional Order to replace the Licence, the Board would sanction the term for the larger loan being extended to 25 years."

Mr. ROBINSON, in moving the adoption of the resolution, reviewed the circumstances under which the matter came before the Council in its present form. He said that in December, 1887, a resolution was adopted that steps be taken for obtaining the necessary powers for electric lighting. First they applied for powers for public lighting; and subsequently the Gas Company applied for a Provisional Order for public lighting also. The Corporation then sent in the necessary notice for an Order; and as the Gas Company saw that they were opposed by the local authority, they withdrew their notice and did not proceed with the matter, so that the Corporation determined to seek powers for private lighting by means of a Licence. The course which they now had resolved to adopt was one which had the merit of economy to recommend it. Under the former arrangement, 2¾d. in the pound would have been what they would have had to pay; but under the present scheme, it would be only ¾d. The Committee had £4000 to their credit; and they anticipated that, by judicious management, they should be able to pay their contractors as they went along, until they obtained the Provisional Order next session, so as to extend the repayment for a longer period. He felt pretty confident that there would be no opposition to the proposition. They provided in the estimates this year for £4000, which he believed would not be taken up; for they anticipated they would get on without using that amount of money. The dynamos, he added, were in the manufacturers' hands—some of them he believed were finished; and he anticipated that early this winter a considerable portion of the city would be lighted by electricity.

Mr. J. B. HEALY seconded the motion.

Alderman PERRY said they had been promised the electric light early this year; and yet there was not at present a roof on the building from which the current was to be distributed. It had not been sufficiently explained to the Council and the citizens why the Committee first went in for a public lighting scheme, and after spending over £200 on obtaining a scheme which proved to be unworkable, had to dovetail another scheme into it in order to reduce the expense. The alleged conduct of the Gas Company was a very lame excuse. The Council were asked now to give the Committee unlimited power, because the obtaining of a Provisional Order would amount to that. The statement that there would only be a cost to the citizens of ¾d. in the pound, was very catching; but the Committee had bound the city to pay £40,000 a year for the maintenance of the works, and this would have to come out of the rates. It was claimed that the electric lighting would produce a revenue of £14,000 a year; but there was no municipality in the three kingdoms in which such a revenue was yielded by an electric lighting undertaking. Again, it was only intended to put the electric light in a few favoured spots. The inhabitants of the poorer districts would not get it at all; and he did not see why they should be taxed for it. He believed that instead of ¾d. in the pound, it would turn out to be 5d. or 6d He was entitled to ask who the contractor for the works was, and also whether it was true that security to the amount of £10,000 was to be given.

Mr. MAYNE said the Corporation did not move in the matter of electric lighting until the Gas Company applied to the Board of Trade to grant them a Licence to supply it. In order to prevent a second monopoly from being cast round the neck of the citizens, the Corporation made their first application. Then the Gas Company applied for power to supply private electric lighting to a particular area of the city; and thereupon the Council had to apply for private lighting powers. As to the contract, they had found it necessary to take the greatest care in preparing it; but he believed it would turn out most successfully.

Mr. ROBINSON said that Alderman Perry was one of those who had tried to throw every obstacle in the way of the Committee. The contractors for the scheme were the Electrical Engineering Company of Ireland; and with regard to the securities of the contractors, they had, as a matter of fact, double securities. They had a security of £7000 from Mr. Robert Hammond, and a bond of £3000 from three leading citizens of Dublin; and the Electrical Engineering Company of Ireland had entered into a contract with Messrs. Bowler, of Leeds, for £10,000.

The resolution was adopted.

DUNDEE AND THE ELECTRIC LIGHT.

A Special Meeting of the Dundee Gas Commission was held yesterday week for the purpose of considering the Committee's report on the proposed introduction of electric light into Dundee. The Committee at their last meeting resolved to proceed with the installation of the electric light, and proposed to have remitted back to them to negotiate for suitable ground for a station, and to suggest an engineer, and to report. Lord Provost MATHEWSON presided.

Ex-Provost BROWNLEE moved the approval of the minutes, and briefly stated the circumstances which had led up to that point. As they were all aware, he said, the electric lighting movement was very much "knocked on the head" by what was known as Mr. Chamberlain's Act of 1883, which made it practically impossible for companies to enter the field; and the result was that for a number of years following electric lighting made no progress. In the meantime, however, electrical engineers were busy; and they had now so improved their knowledge of plant, that the subject was further pressed upon the Government. In 1889 the Government passed a public measure giving very much more favourable terms to companies—in short, giving to companies the liberty to put down installations in a town, and practically leases of 42 years. They also gave a very distinct indication to corporations that they would not be allowed to prevent companies from erecting installations should they not be prepared to erect them themselves. These facts forced the matter upon the consideration of the Dundee Gas Commissioners; and nearly two years ago they resolved to make application for a Provisional Order, rather than allow any outside company to install itself in Dundee. The Provisional Order was obtained in the month of August last year; and the Commissioners were now bound to carry out the work. If they did not now do so, they would not be heard if they tried to prevent any company appearing on the scene. They had therefore to consider whether they would now proceed to carry out the powers which Parliament had given them; and as they saw by the minute before them, the Committee recommended that they should proceed with the installation. The report which Mr. Mitchell and he had submitted showed that, after making a careful inspection of some of the installations on the spot, they quite plainly indicated to the Commission that they could not expect for the first few years to make both ends meet. As far as their observation went, there would be a loss to begin with; but they must bear in mind that the experience of corporations was so

very limited that no person could speak with authority on the point. There was, in fact, only one corporation in England that had had any experience—Bradford. Nearly all the Provisional Orders granted before 1889 had been allowed to lapse. Since 1889 there had been a perfect crowd of Provisional Orders obtained; and up to the end of the present year, he thought that no fewer than 169 were to be proceeded with. With regard to the installation, that was a point they could not even speak of with certainty; but there was the satisfaction in it that there was no need whatever to go to any large outlay at the beginning. The first thing to be done would be to secure a central piece of ground—about 40 poles, he should recommend. The installation might be very small indeed until the demand arose for the electric light. The almost universal method on which to proceed with installations was by having the engines and dynamos combined; and the engines to start (say) from 80 to 200 horse power. Under these circumstances, he thought the cost of the installation would be from £15,000 to £20,000. In Bradford the installation cost £35,000; but in Dundee he did not anticipate that they would require such a large installation to begin with. It would, he thought, be very short-sighted policy if they allowed a public company to install itself in Dundee between the Gas Commissioners and the public; and he had therefore much pleasure in moving the adoption of the minute.

Ex-Provost Ballingall seconded the motion. It seemed to him, he said, that there was no other course left open to them as a Gas Commission than that embodied in the motion. It would have been well, and many of them would have been much better pleased, if the Board of Trade would have given them another two or three years' grace, before being called upon to face such a large capital expenditure. He was glad to hear it was proposed to limit the amount, in the first instance, to £15,000 or £20,000. It struck him at first that some such limit would require to be mentioned; otherwise the public would consider that the Commissioners were to embark upon a scheme that might probably cost them a very considerable sum of money. He thought with Mr. Brownlee, that the Commission would make a loss. He believed there would be a small loss to begin with for the first year, although before long electric lighting would be made to pay. He understood there were now some eight or ten private firms in Dundee who were about to adopt it; and it was only three days ago since he was told that one firm had resolved to introduce an installation into their works, which, it was stated, would lessen their gas account something like £600 a year. When they heard such statements as these coming from practical business men—men who counted the cost of any enterprise before entering upon it—he was sure no reasonable man in the community would object to the recommendations of the Committee.

Lord Provost Mathewson said that, after hearing the speech of Mr. Brownlee and that of Mr. Ballingall, there could only be one opinion as to the propriety of the proceeding proposed by the Committee. They knew what the Commission had to face in the first instance—a small loss perhaps for a few years; but that would be as nothing compared to the fact that if they did not avail themselves of their opportunities, and allowed a company to step in, if the city wished to purchase the concession even after twenty years, it would cost a very large amount of money. He thought, therefore, they could not do better than adopt the recommendation of the Committee.

The motion was put to the meeting, and carried unanimously.

The Proposed Purchase of the Rushden Gas-Works by the Local Board.—A largely-attended meeting of the ratepayers of Rushden was held last Wednesday, to consider the proposed acquisition of the gas-works by the Local Board on behalf of the town—a matter to which reference was made in the Journal last week. A resolution was moved, requesting the Board to take steps to purchase the works, if equitable terms could be arranged. After a long discussion, this was carried; but a poll was subsequently demanded.

The Durham Gas-Works Dispute.—At the Durham City Police Court last Thursday, several cases of threatening arising out the dispute at the Durham Gas-Works (see *ante*, p. 354) were investigated by the Magistrates. Allegations were made against the men that they had gone to the house of one of the workmen at the gas-works, kicked the door and burst it open, and then threatened to stick a knife into the "blackleg." The men were bound over to keep the peace, and one, who was convicted of doing wilful damage, was fined 10s.

Extension of the Chorley Gas-Works.—Last Tuesday, Mr. Arnold Taylor held an inquiry at Chorley as to the application of the Town Council to the Local Government Board for sanction to borrow a sum of £10,700 for gas-works and other purposes. The original application was for £7482; and the Town Clerk (Mr. T. J. Jackson) explained that the Council had powers given them by Acts of Parliament to extend the gas-mains to several of the surrounding townships. Under this power, application had been made by certain inhabitants of Whittle-le-Woods and Wheelton for a supply of gas. The Town Council had decided to comply with the request, the cost of which in laying the necessary mains would be £4213. The remainder of the money would be devoted to other purposes, particulars of which were given; and the inquiry then closed.

East Worcestershire Water-Works Company.—An extraordinary meeting of this Company was held last Thursday, for the purpose of authorizing the Directors to borrow any sum not exceeding in the aggregate £5000 on mortgage, or by the creation and issue of debenture stock. Lord Windsor presided; and in moving a resolution to the above effect, said he thought the shareholders of the Company were perfectly well aware that it had been the intention of the Directors to keep the capital expenditure as close as possible, because the Company had not yet arrived at the position of paying a satisfactory dividend. The time, however, had at length come when a very important addition to the Company's undertaking should be proceeded with, and that was the extension of the supply to Droitwich. The negotiations had been going on for some time past; and the Directors could now report that the undertaking could be proceeded with at once, if the shareholders would authorize the raising of the necessary capital. Dr. Blake seconded the resolution, which was agreed to.

THE MUNICIPAL OWNERSHIP OF QUASI-PUBLIC WORKS.

(*Concluded from p.* 495.)

The economic problem for government is: How to secure a necessary income without retarding, but rather with the encouragement of, private industry.

What are the agencies by which increased valuation is given to property within the radius of their influence? Look about you, and your first answer will be: Highly developed, permanent improvements. The conditions of the tenure of possession, which alone can secure such improvements, need no further elucidation. They are a matter of common knowledge. Sometimes it has been thought the part of wisdom to induce such improvements in certain localities by making a free gift of land or pledging the credit of government for the cost of the improvements desired. A government may, with the expectation of increasing the taxable value of all property under its jurisdiction, present farmers, mechanics, manufacturers, merchants, and bankers each with a title-deed to the land he requires. Title-deed and franchise are two names for the same thing. The value of such a gift depends entirely upon the conditions stipulated in the franchise. Would the government realize its expectations to the fullest possible extent if the conditions in the franchise were as follows? The conditions of this franchise are that the beneficiary shall have the right to use ordinary tools, apparatus, or implements; but if he shall desire to use improved tools, apparatus, or implements of any kind, he shall first obtain a new franchise. The government shall have the right to fix annually the wages, rate of interest, or selling price of his product. This franchise shall not be transferable. It is subject to revocation, amendment, or alteration at the pleasure of the government, and shall terminate absolutely at the expiration of a period of ten years. Can human ingenuity devise conditions more paralyzing to private industry and enterprise than these? How many of the magnificent improvements in any city would be in existence to-day, think you, if it had been necessary to lay their franchise on a foundation like that?

If, notwithstanding the defective title conveyed in his franchise, a beneficiary undertakes to make improvements and seeks to secure funds for that purpose by mortgage bonds or an issue of stock, putting his enterprise into the form of a corporation, how are his securities regarded by financiers? It is a financier's industry to obtain tools for those who can make a profit by using them. As he cannot have a personal control over the management of the undertakings, he accepts a fixed rate of interest, and exacts security against risk and loss. Since the uncertainties of life and industry always give some colour of risk to every transaction, he raises or lowers the rate of interest a degree to correspond with the varying elements of risk, and the length of time for which the tools are to be used. For this reason his rates differ all the way from the lowest rate on government bonds up to the highest rate it is possible for any person to pay. In the case of *quasi*-public corporations, there are so many elements of risk that the most conservative financiers do not regard their securities as favourite investments, and do not handle them. Those who do handle them require a rate double that of the best securities. This is a tax caused by the government, but not paid to the government; it is paid to financiers. It is an element of cost generally overlooked.

The inquiry may be made: "Does not the State fix the rate of interest?" There will be no evasion in the answer. "Certainly; here is the law. Six per cent. is the legal rate." The law cannot compel financiers to accept the securities offered, or to make loans at 6 per cent. or at any other rate of interest. If governments will remove all uneconomic restrictions from the franchises granted to *quasi*-public corporations, making their right to unmolested possession of their position, and business is perfect as Trades Unions demand for labourers, as Civil Service laws guarantee to government employees, as is universally granted to farmers and all owners of real estate the world over, wherever industry is encouraged and a high degree of prosperity has been induced—if this is done (the doing of it will cost nothing, as it is simply a change of economic condition), such corporations can then obtain all the tools they can use profitably at 6 per cent., or less. They will then be justified in making, and can obtain the means to make, the most substantial and serviceable improvements that science can devise. Improvements so made will cost much less for maintenance and operation than those constructed in the temporary manner made necessary by a defective franchise. This is another increment of advantage wholly lost to the public by reason of the ill-advised economic conditions contained in defective franchises. In the direction of perfecting the franchise for *quasi*-public corporations, and not in the direction of governmental ownership, lies the true solution of the problem: How can the public gain the greatest economic advantages by means of *quasi*-public works?

Another feature requiring close attention is the fact that the plants of *quasi*-public works are useful only where they are installed; and their products can be sold only where produced. In this respect the necessary limitations under which they operate are much more severe than those pertaining to labourers, farmers, other manufacturers, merchants, or financiers.

Gold is the tool of finance. It has a high intrinsic value; it can be easily transferred, and can be used in any other country in the world. The basis of financial transaction is always the value of gold *plus* the certainty of payment in gold. In every country, and for every enterprise, careful note is taken of every economic condition that marks a degree more or less favourable in variation from a gold standard. For every degree a per cent. is added to, or taken from the rate charged for the use of money. Money is always cheapest and most plentiful where it is subject to the least risk; always dearest and least plentiful where it is subject to the greatest risk. This law controls the finances of the world. It fixes national financial conditions. It was not established, nor can it be abolished by any government. The forces that control financial action operate from beyond the limits of all governments. They are commensurate with the whole domain of human enterprise. The municipality, state, or nation that establishes economic conditions most nearly in harmony with the requirements of economic laws will draw to itself the migratory wealth of the world as surely as the magnetic needle points to the pole.

It will be seen from the foregoing that unwise economic conditions in franchises granted for *quasi*-public works are most potent factors in enhancing the price charged for their services. This increase of expense is a tax on labour levied by ignorance, for which no compensating gain can be shown. By a simple change of conditions that can be made without cost to anyone, untold thousands of dollars can be kept in the possession of labourers, gaining for them a great and perpetual benefit.

Another governmental restrictive feature is the taxation of franchises or of the industries conducted under them. Such taxation is not in harmony with true economic conditions. Values accrue from improvements and the use made of them. The amount of a clearing-house balance is always but a small percentage of its total transactions. If it be on the right side, however, the flow of business is unchecked. If on the wrong side, be the amount ever so small, a panic ensues, and all industry is thrown into disorder. This is the effect of a tax on *quasi*-public works. It throws a balance—a very small balance—against the industry of the entire body of labourers. It has the power to hold in check the growth of values a thousand times its own amount. It may be said that taxes so laid differentiate themselves through the community in a way to do no final injustice. So they do differentiate themselves through the community, but always along the line of least resistance, in obedience to a natural law, just as water seeks its level or electricity seeks the earth. Who offer the least resistance to the collection of such taxes? Clearly, the poorest labourers; those who are least able to choose the conditions under which they live and work, and who, in proportion to their income, are larger consumers of the services rendered by *quasi*-public works than any other class of the community. The income of such labourers is never equal to their necessities. Every dollar secured as an addition to their profit, is a dollar at once issued in circulation.

The improvements made and the services rendered by *quasi*-public works are the cause of the wonderful growth of modern cities. To appreciate this fully, try to estimate what the valuation of a city would be without these improvements, and compare it with the valuation of to-day. Does not the difference in valuation exceed the total cost of these improvements many hundred times? This being true, is it not the very essence of unwisdom to restrict and tax them as is being done? If they have increased the taxable value of property so enormously, hampered as they have been by defective franchises and unwise taxation, what might not have been done, what may not yet be done, if by a change of these conditions they are brought into harmony with true economic requirements? As it is, you are choking the forces that have no power to add to their own area of usefulness, without increasing the value of all property within the zone of their influence.

I cannot resist a desire to make a general observation at this point, though it may be a seeming digression. I wish to say to mechanics, farmers, and labourers, whoever they are and wherever they may be, that there is no essential reason, in the nature of things, why they should not obtain the use of tools at as low a rate of interest as can their government. The economic evils from which you suffer are the outgrowth of conditions fixed by legislative enactments in obedience to your own demands. You have been honest in your views; you have tried to gain prosperity by fixing conditions as you supposed in your own interest. You have been scared by the word "monopoly" while seeking to secure or enjoy the benefits of a monopoly for yourselves. Government is a monopoly. It cannot pay for anything without extracting the means to do so out of the profits of private industry. Government lives on private enterprise. The real security offered by a government is the property and industry of the people. Its power to convert these to its own use, its exclusive and perpetual power to do this, is its franchise, the fundamental foundation of its credit. Prosperity does not flow from the government to the people, but from the people to the government. Restrictions that impair individual credit and enterprise are a direct hindrance to the production of wealth, and afford no corresponding compensation; they cause an absolute loss of energy. Restrictions of the same character produce identically the same effects on corporate as on individual credit and enterprise. The people have been taught that monopolies were their oppressors. They have demanded their extinction, and that the government shall own and operate all *quasi*-public works; and they have thought that it should erect new works in competition with those owned by private corporations, the more surely to crush the life out of their oppressors. I maintain that the cause of the trouble is in the failure of the people rightly to interpret and to act in harmony with economic laws.

I count myself fortunate in having the acquaintance of working men who are daily contending with these problems while using, as best they may, the tools of their trade. I believe I voice the true demand of every honest labourer when I say for them that what they desire is that economic conditions shall be so fixed as to enable them, with the greatest degree of certainty, to obtain by virtue and right of their own labour, honestly applied, a home and an income sufficient to maintain a standard of living commensurate with the comfort and dignity due to an independent American citizen.

The elaboration of this subject is as broad as human experience. To select the things that may be said on one occasion is like picking up a shell here and there to carry away, leaving the whole beach behind. Let me leave for your careful consideration a memorandum of the way you have sought to gain economic advantages without giving economic equivalents—an undertaking that must inevitably end in failure. You cannot obtain something for nothing, any more than you can maintain a vacuum in the open air.

(1) In dealing with gas companies, you have sought to gain an economic advantage by issuing franchises to different companies in the ignoble hope that they would be for ever fighting, and thus give you a chance to fatten on their blood. Your experience and the present condition of the gas industry in your city [Baltimore] renders comment unnecessary to make clear your absolute failure to gain an economic advantage in that way.

(2) You are seeking an advantage by taxing the receipts of street railroad companies. You are taxing the carriages of the poor to relieve from taxation the carriages of the rich. With what results? Your street car service is pronounced, by those best qualified to judge it, to be among the poorest in the United States. Remove the restrictions, and thus earn the right to demand the best service that can be rendered for the price charged. This done, the gain of municipal income from the increased valuation of property will largely exceed the amount of the tax remitted.

(3) You complain of the poor aërial construction erected by electric lighting companies, and, in the same breath, as it were, talk about bonding the city for $2,000,000 to enable you to build a municipal plant in competition with the companies now doing business. Read the conditions fixed in their franchises, and ask yourselves what kind of improvements you would make on real estate with a title containing similar conditions. Again, you are asking them to abandon a comparatively inexpensive aërial construction, to adopt an exceedingly expensive underground construction, without guaranteeing to their occupation the protection demanded for labourers by Trade Unions, and without offering them an increased compensation on account of increased investment. Do you think this reasonable? Is this the way to encourage industry and induce prosperity?

(4) You are calculating on the coming of the day when you can improve the service and reduce the cost of telephonic communications through the rivalry of competing companies. You might as well attempt to improve the navigation of a shallow river by dividing the stream as to undertake to secure such result in that way.

At every point of contact with your *quasi*-public industries, your arrangement of economic conditions harmonizes about as well with the requirements of economic laws as the act of the man who, finding a river crossing his path, sat down on its bank to wait for the water to run by, so that he could cross over on dry land. That man had a long wait ahead of him. There is as long a wait ahead of you, before you will secure the largest degree of economic advantage from your *quasi*-public industries in the way you have undertaken and are proposing.

All ways have been tried but one. The failures suffered are the result of the operation of natural economic laws as surely as the falling of a ton block of marble when sustained by half-ton supports. Is it not time to give up trying to secure economic advantages in direct opposition to the forces of Nature? Fix all conditions for the encouragement of individual and corporate industry in harmony with the requirements of economic laws, and all the forces of the universe stand pledged to your success. Guarantee the conditions indicated, and you will render it impossible for any municipality in the world to gain an economic advantage over you. You cannot reach this ideal without making a great and permanent gain in economic intelligence. Such a gain will brighten every life with a new hope, will guide all energy with more perfect skill, and bless all repose with secure comfort. To obtain this result, your method should be to give everything for economic education, nothing for political corruption. Progress gained on such terms will be honourable and lasting.

THE INTRODUCTION OF A FUEL-GAS SUPPLY INTO ST. LOUIS, U.S.A.

Reported Failure of the Experiment.

The *American Gaslight Journal* of the 7th inst. gives the following extract from a St. Louis paper:—

The attempt of the Laclede Gas Company to bring non-illuminating fuel gas into general use in St. Louis is a failure; and the Company, unless the consumption increases largely, will very soon stop supplying it to households. "We made a canvass of the territory covered by the fuel-gas mains last May," explained Colonel W. A. Stedman, the General Manager of the Company, and "succeeded in obtaining 80 consumers, for whom meters were set and the gas turned on. The low price, 40 c. per 1000 cubic feet, at which this gas was offered, led us to expect a rapid increase in the number of consumers and in the amount sold. We have been disappointed in this expectation. We have the plant to make the gas, and a system of independent mains to distribute it; and we hoped to utilize these to their full capacity. But the number of consumers on these lines has decreased rather than increased; many having discontinued the use of fuel gas, and returned to using the regular illuminating gas, especially where gas cooking-stoves were used. There were complaints made as soon as the use of the fuel gas began. Those who had been using illuminating gas in their cooking-stoves were impatient of the slower process of the fuel gas. The complaints were mostly that it took too long to cook anything; too long to boil water, or to heat the ovens. Of course, fuel gas has not the intense and rapid heating power of illuminating gas; and so it was to be expected that a greater volume of the former, and a longer time, would be required to produce a given amount of heat. All this was explained to the fuel-gas consumers; but many preferred the intenser heating power, and particularly the more rapid results, obtained by the use of the other gas. Then the objection was made by some of the consumers that, as the fuel gas required larger volumes to be consumed, and a longer period of continued use to produce results, a great quantity of heat was lost by radiation—resulting in unnecessarily raising both the temperature of the room, and of the cook. This was one among many reasons given for preferring the illuminating gas for cooking operations. 'Its heat is intense, and the required temperature of oven or boiler is attained in a moment,' said a consumer the other day; 'there is no waiting to get up heat to cook with, and that is a great consideration in hot weather.' A lady said she preferred the gas with which she could get breakfast in 20 minutes, rather than a lower-priced gas that required 45 minutes for the same meal. So the original consumers have diminished in number until less than half remain. Fuel gas is non-luminous; and it is the illuminating elements in a gas which greatly increase the cost of its production. These same elements increase also very greatly the heating power of such gas. Our fuel gas has rather less than one-half the calorific power of our illuminating gas. The latter at our net price of $1.18 per 1000 cubic feet is really a very economical fuel; and our experience seems to indicate that our patrons prefer it on account of its greater energy and activity, and for the other reasons before stated, to the fuel gas at a lower price. The economy of the low-priced fuel

gas is not very apparent where small quantities are used, as in ordinary domestic operations. For example, a breakfast of steak or chops and a pan of biscuits and 2 quarts of water boiled for coffee, would require the consumption of 12 feet of gas in an ordinary range at a cost of 1.4 c. with illuminating gas; and it is claimed that, in an operation of this kind, the saving of ½ c. is more than offset by the same results with fuel gas. However, as we have started to make fuel gas, and cannot afford to have our fuel mains lying idle, if it is possible to have them earning something for us, we have concluded to cut the present price 25 per cent., and from Sept. 1 shall charge only 30 c. per 1000 cubic feet for non-illuminating fuel gas consumed after that date. Coal is very cheap here; and although a gaseous fuel has many advantages, and the heat resulting from its combustion can generally be utilized with only a small percentage of loss, yet for house heating purposes very large quantities would be required, and to equal coal in economy for this purpose it would have to be sold as low as 5 c. per 1000 feet at least. We hope at the low price of 30 c. per 1000 feet to develop uses for our fuel gas which will warrant our continuing its distribution. Unless we secure a decided increase in its consumption in the near future, however, we shall be obliged to discontinue its manufacture; as only its sale in very considerable quantities will make the business remunerative at this price. There is always a certain amount of leakage in gas-mains; and the volume lost is the same whether the consumption from the mains is large or small. Therefore, if the sales per mile of main are small, the proportion of lost gas, or the percentage of loss, is very heavy, and correspondingly small when such sales are large. This consideration, of course, is a very potent one in determining whether we can afford to continue our experiment of furnishing a purely non-luminous fuel gas as an adjunct of our illuminating gas business."

PUBLIC LIGHTING IN EASTERN EUROPE.

[From the *Board of Trade Journal.*]

The French Government having desired its Consuls in the principal towns of the east of Europe to report on the public lighting of those places, the representatives of France have furnished particulars on the subject, which are published in the *Moniteur Officiel du Commerce* for July 9 and 16.

According to these reports, it appears that there exists no manufactory of lighting apparatus in Roumania, with the exception of one recently founded in Bucharest. This, at present, does no more than produce wick-holders for petroleum lamps; the cylindrical glasses for the same are principally made at the glass-works of Azuga. It is intended to make lamps in the Bucharest factory; and before very long it is probable that the whole apparatus for lighting with petroleum will be manufactured at least at one place in Roumania. With the exception of certain small accessories, everything connected with lighting by means of gas has to be imported into Roumania from abroad. Most of the lamps now used in that country are furnished by makers in Austria-Hungary—mainly from Vienna and Buda-Pesth. Lamps are also imported, but in much smaller quantities, from Germany.

There is no gas used in any town of Roumania except Bucharest. Everywhere else simple petroleum lamps are used; and the town of Galatz is lighted by 1695 of these. At Jassy, the theatre and the circus have lamps of vegetable oil; but everywhere else petroleum only is used in glass lamps with a straight wick. For domestic lighting, lamps of all dimensions are used, with burners and circular wicks; all which lamps are imported from Austria or Germany.

When we turn to Servia, we find that Belgrade, the capital, contains no manufacturer of illuminating apparatus. The streets are lighted by a few petroleum lamps with reflectors, and when the Municipality has need of a supply of lanterns, it applies to the Jewish tinmen, who produce what is required. Nisch is lighted only by petroleum lamps at certain important points of the town; and there is not even a shop devoted to lighting or lamps. The latter are ordered from Vienna or Buda-Pesth, and sold by grocers or dealers in hardware.

In Sofia, the capital of Bulgaria, there are several dealers in lighting apparatus; but there is no manufacturer of these articles in any part of Bulgaria. What is used comes exclusively from abroad, and principally from Bohemia. There is a small importation of glass lamps from Belgium. No other substance than petroleum is used in any part of the country. Lighting apparatus only figures in the Bulgarian trade reports under the head of "Glass Manufactures." The figures of the import value of such articles, in 1889, was £5400. In Varna, as in Sofia, petroleum alone is used for lighting. The favourite form of lamp is a cheap suspended lamp, with a single burner. There is a great sale at Varna of small lamps, specially introduced for the little towns and villages of the interior. These are made of glass, and cost about 18s. a hundred.

In European Turkey little is used except petroleum. Even in the public offices of Constantinople, into which gas had been introduced, it has been found so bad, and so expensive, that it has for the greater part been rejected, and petroleum once more taken into use. In private houses, as in shops, *cafés*, and restaurants, nothing is now used but the large petroleum lamps. The electric light is employed only in the palace of Yildiz, it being forbidden by law to use it elsewhere. The supply of lamps for Constantinople is almost entirely in the hands of Austrian and German merchants. The kinds which they supply are usually of second-rate or even inferior quality, cheapness being an essential matter. The natives are in the habit of calling petroleum "gas," even when they are speaking French; but it is important to understand that they always mean petroleum. There are three French shops in Pera, and an Austrian house in Stamboul, where lamps of a better quality may be bought.

At Adrianople no gas is manufactured, and an attempt which was lately made to illuminate the city with the electric light was a complete failure. The only material used is petroleum, which is imported from the Russian establishments at Batoum. The city is lighted by very cheap lamps on a most imperfect system, consisting merely of a cylindrical box of tin-plate, scarcely 8 centimetres high, and priced at from 8d. to 9d. each. The inside of certain establishments, such as the *cafés* and hotels, is lighted by lamps of a more elaborate description, from Austria or Germany. Austria inundates the country with a cheap article devoid of all solidity of construction, but sufficient to satisfy the requirements of the Turks.

The only product employed for lighting purposes in the island of Crete, except candles, is Russian petroleum of very bad quality, and dispersing a disgusting odour. The lamps are generally very common, but cheap. Most of them possess a glass reservoir, mounted on a stand in porcelain or metal. These are imported from Austria. No manufacturer of lighting apparatus exists in Eastern Roumelia. Petroleum lamps are used; and these can only be purchased in the capital, Philippopolis. At Bourgas, the chief port of Roumelia, all lighting apparatus has to be brought from Constantinople.

Oil is but very little used for lighting in Salonica; and, consequently, there is no sale for articles intended for this species of illumination. Gas-works have recently been set up in Salonica; but, hitherto, the number of consumers has been very small. Petroleum is almost exclusively used throughout the town; and there is a considerable market for apparatus used in this kind of lighting—portable lamps of all sorts, with glass, porcelain, &c. All these articles are of Austrian manufacture, and of inferior quality; but they find a ready sale, on account of their cheapness. A Paris house attempted, some time ago, to introduce in Salonica lamps of its manufacture; but they were not bought, as they were too expensive. A manufacturer who wishes to sell his lamps in this town ought, first of all, to obtain information as to the price at which similar articles are at present sold there.

The only form of illumination which is employed in Albania is petroleum lamps, the importation of which reaches a value of £500 or £600 a year. None are manufactured in the country, even at Janina, Scutari, or Durazzo, but are manufactured in Austria and introduced from Trieste to ports along the Albanian coast, and sold in the bazaars. In Bosnia-Herzegovina, also, gas and oil are totally unknown as illuminants, and the whole country depends on the importation of cheap petroleum lamps from Austria.

In Greece, gas is used in the towns of Athens and Corfu. In the former everything connected with lighting by gas is supplied by a French Company on the spot; in Corfu the apparatus has to be imported from an English Gas Company at Malta. In the rest of the country, lighting is almost exclusively performed by means of petroleum lamps of Austrian or German manufacture. At Syra, there exists no person who regularly sells lighting apparatus of any description; but very bad porcelain or metal lamps may sometimes be picked up at the china or tin shops. There was once a proposal that Syra should be lighted with the electric light; but the poverty of the Municipality and political reasons combined to prevent it.

Mr. T. B. Sandwith, Her Majesty's Consul-General at Odessa, writing to the Foreign Office, under date of the 1st of August, says that the port of Odessa, in contradiction to the town of that name, having, for many years, remained unlit, even by oil-lamps, and, within two years only being lit by gas, has at length been illuminated by electricity. An installation has been completed, at a cost of 80,000 roubles (£8400). This consists of 64 arc lamps, of 2000-candle power each, and of two lanterns, one at each end of the breakwater, which runs the whole length of the port. The illuminating power is generated by two of Wilson's vertical engines, of 67-horse power each. The Odessa Town Council has just assigned a sum of 20,000 roubles (£2100) annually for the working expenses. The new installation is a great boon to the shipping interest, the whole of the port being brilliantly lighted up, so as to admit of the loading and discharging of steamers by night.

THE AMERICAN METAL TUBE TRADE.

Writing under date of the 4th inst., a New York correspondent of *The Times* says: Some weeks ago the National Pipe and Tube Company was incorporated under New Jersey laws, with capital stock fixed at only $10,000, but with power to increase indefinitely. Such a small concern attracted no attention at the time; but, as now seen, it was the preliminary step to one of the most important combinations ever effected in the iron and steel trade of this country. On Thursday papers were signed increasing the capital stock to $11,500,000, of which $5,750,000 is cumulative 7 per cent. preferred stock, and the balance common stock. The combination now include the National Tube-Works of Boston (the largest company of its kind in the world), the Republic Iron-Works of Pittsburgh, Pennsylvania, the Monongahela Furnace Company of Pennsylvania, and the Boston Iron and Steel Company. The different Companies manufacture iron and steel tubes for water, gas, oil, &c., drills for oil and natural gas wells, muck bars, blooms, terne-plates, &c. Several other concerns are expected to join; those definitely spoken of being the American Tube Works, Messrs. Morris Tasker and Co., of New York, and Messrs. Spering, Schafalt, and Co., of Pittsburgh. The National Tube Company of Boston, before it joined the combination, was capitalized at $3,000,000. For years past the stock has paid dividends of 12 per cent. per annum, while the other Companies have paid 6 per cent. or over. With such profits as these, the reason given out by the promoters of the combination for their action—"a concentration of business interests and reduction of operating expenses"—is not altogether sufficient. One of the members, when questioned on the subject yesterday, admitted that the maintenance of prices was also an object. That it is the object the trade here has no doubt; and many for "maintenance" read "enhancement." The parties to the new arrangements are thoroughly well satisfied with their prospects, and among them have taken up every dollar of the capital stock—not a single share having been offered to the public at any price. A year or two ago, this combination would have been called a "trust;" but the name has fallen into serious disrepute since the sugar people, Chicago gas, and others played such strange and shady pranks under it. There are also anti-trust laws in existence; and spasmodic efforts are made to enforce them. To escape the operation of these is, however, not difficult. Leave "trust" out of the title of your combination, and you may include all the other features with impunity.

THE PUBLIC HEALTH (LONDON) ACT, 1891.

The following is an abstract of the portion of the Act introduced by Mr. Ritchie for the consolidation of the various laws relating to public health in London, so far as it refers to "water supply." The Act itself consists of 144 clauses and four schedules.

CLAUSE 48. A house without a proper water supply to be considered unfit for habitation, and may not be occupied until a certificate is given by the sanitary authority.

CLAUSE 49. When a water company cuts off the supply from a house, notice is to be given to the sanitary authority, under a penalty of up to £10.

CLAUSE 50. Every sanitary authority to make bye-laws for securing cleanliness of tanks and cisterns for the storing of water for potable purposes.

CLAUSE 51 gives control to the sanitary authority over public cisterns, reservoirs, fountains, wells, &c., which are to be maintained by the authority.

CLAUSE 52. Any person permitting washings from a gas-works to flow into any source of water supply will be liable to a fine of £200, and £20 for every day the offence is continued.

CLAUSE 53. Any persons fouling the water of any well, fountain, or pump may be fined £5 and a penalty of 20s. per day.

CLAUSE 54 gives power to close polluted wells, tanks, or cisterns. A Petty Sessional Court may order an analysis of water on receipt of a complaint.

THE NEW BIRMINGHAM WATER SCHEME.

There was published in *The Times* of Thursday last an interesting *résumé* of the Birmingham Water Question as it is at present forcing itself on the attention of the local public.

Our contemporary's correspondent wrote: In view of the anxiety which has lately been expressed in various quarters respecting the quality and sufficiency of the London Water Supply, it may be of interest to glance at what is being done by the authorities of another populous and busy centre, to secure themselves against the prospective danger of a water famine. Birmingham has lately awakened to the necessity of considerably improving and extending its area of supply, in order to provide for the needs of the early future; and a costly and carefully-elaborated scheme with this object will shortly be submitted for parliamentary sanction. In the case of London, happily, there is no reason to apprehend any immediate failure of the supply, even in face of the rapidly-growing needs of a population of five millions; but as it is mainly drawn from the upper waters of the Thames, which are becoming year by year less fit for consumption, it is only prudent and natural that the City Corporation and the London County Council should begin to cast about them for some ampler and purer sources than any of those controlled by the nine Companies upon which the London public is dependent. The problem is one that has to be faced sooner or later by nearly every large town in the kingdom; and the boldest and most costly solution is in the end generally the most satisfactory. Glasgow has laid under contribution the crystalline waters of Loch Katrine and the neighbouring lochs, some 27 miles distant, at a total cost of over two and a half millions sterling; but the outlay has been amply justified by the reduction of the water-rate from 1s. 2d. to 6d. in the pound. Manchester has incurred a yet heavier cost in tapping the waters of Lake Thirlmere, nearly 100 miles away; and Liverpool has reinforced its supply from the upper waters of the Vyrnwy. Birmingham, like London, looks to Wales as its future source of supply; and the scheme of the Midland city is first in the field. It proposes to tap the watershed of the Radnorshire highlands at a distance of 80 miles from the city; and to bring the pure waters of the Elan and the Claerwen, at a cost of four millions sterling, within reach of the inhabitants, not only of Birmingham, but of a wide and populous district round about for which the City Corporation is the constituted water authority.

As matters now stand, the wells and streams from which the Birmingham Water Supply is obtained yield about 20 million gallons in an ordinary season, and something over 17 million gallons in a dry season. In 1889 the average demand was over 14 million gallons; and the maximum consumption at special periods of the year was about 18 million gallons. Judging from the experience of recent years, the average daily demand in 1893 will be quite equal to the present maximum; and in times of pressure, it may be expected to rise to the full capacity of the works. If the same rate of progression is maintained, it is clear that, in nine years, the ordinary daily demand will exceed the resources of the water department, and then the inevitable water famine must be faced. Within 25 years the requirements of the district will probably be doubled; and they are likely to be trebled in 50 years. Clearly, then, the Birmingham Council have no option, in common prudence, but to take measures forthwith for securing new and considerable sources of supply to supplement those which are now available. The first question which presented itself to the Water Committee was whether it would be wiser to adopt at once a bold scheme, that would assure an adequate supply of water for the next 50 or 60 years, or to temporize by developing the actual resources of the water department to an extent sufficient (say) for the next 20 years. On this point the testimony of the Corporation Engineer, Mr. Gray, is important. By making new reservoirs and filtering-beds and increasing the pumping power, at a total cost of about a million sterling, enough water, he believed, might be obtained to meet the wants of the city for the next 20 years. But at the end of that time, the practicable limit of supply from actual sources would be exhausted; and in the meantime the quality of the water must inevitably suffer. By that time, moreover, other sources of supply in the Midlands would probably be appropriated by other local authorities; and the city would have to go far afield for a new watershed. With these facts before them, the Corporation had no hesitation in adopting the advice given to them 20 years ago by Sir Robert Rawlinson, and supported by their Engineer, Mr. Gray, as well as by Mr. Mansergh, C.E., whom they had called into consultation, by seeking at once new sources of supply that should suffice them for the next 50 years. Their first idea was to go to the Severn, the largest river within a reasonable distance of Birmingham; but Mr. Gray finds that to obtain the requisite supply from that source would necessitate the provision of extensive and costly engine power, filter-beds, and large compensation reservoirs. The Teme, below Ludlow, another copious stream, is contaminated. It flows, moreover, at too low a level to supply water to Birmingham by gravitation; while above Ludlow the watershed is not sufficient to yield the quantity required. The other rivers which have been considered are the Ithon, the Wye, the Elan, and the Claerwen. In all the watersheds of these streams, reservoirs, could be constructed to give a supply by gravitation; but as regards gathering-ground, the Elan and the Claerwen are held to be much superior to the others. These rivers are situated partly in Cardiganshire and partly in Radnorshire; and they unite at Nantgwyllt, where the combined river takes the name of the Elan, afterwards emptying itself into the Wye, seven or eight miles above the Ithon. An examination of the district by Mr. Mansergh and Mr. Gray has convinced them that this is the most fitting locality to which Birmingham could go for its water supply.

After a lengthy extract from Mr. Mansergh's report—the main portions of which appeared in the JOURNAL for April 14 (p. 706-8)—the correspondent continues: The Committee ultimately came to the conclusion that the Elan and Claerwen area possessed in quantity, quality, and security all the requisites for the future water supply of the city. From the reservoirs, the water will be conveyed by gravitation through tunnels, cut-and-cover work, culverts, and steel pipes to the Edgbaston reservoir, whence it will be distributed, by simple gravitation, through the city and suburbs; thus entirely avoiding the cost and risk of pumping. The course of this elaborate aqueduct will be through the extreme north of Herefordshire, and thence, by the towns of Knighton, Ludlow, Bardley, Kidderminster, and Stourbridge, to Hagley and Frankley, where it is proposed to build a reservoir in two sections for storeage. From the Frankley reservoir the water will flow finally into that of Edgbaston.

The cost of such a gigantic scheme is necessarily heavy; but it is estimated that the whole undertaking can be completed for a sum not exceeding £4,000,000. This expenditure, moreover, need not be incurred all at once. It is proposed that the masonry conduit should be made large enough to convey 60 million gallons; and that two out of the five mains which will ultimately be necessary should be constructed at once, the others following as required. Thus, the expenditure being gradual, the item for interest and sinking fund would not at first be heavy. But even if the whole scheme were pushed forward and completed by 1901, it is believed that, without any excessive burden upon the ratepayers, the cost may be fully met. In fact, the Committee hope the scheme can be carried out without the necessity of levying any rate in aid, and without any alteration in the parliamentary scale of maximum water-rental, provided only that for a time a small increase be made in the water charges. According to the precedent of the Manchester Act of Parliament, passed in 1879, it is expected that no payment in respect of sinking fund will be required for the first ten years from the passing of the Act. Should this be the case, breathing time will be secured in which to make provision for the easy repayment of the money. In 1881, 1883, and 1884 the water-rentals in Birmingham were reduced to the aggregate amount of £33,000 per annum; and if a certain proportion of that sum were reimposed—say, £24,000 a year—a considerable sum would be realized annually (and accumulated until the repayments commence) towards the expenditure on the new scheme. The ratepayers could hardly object to such a course, as even then they would be supplied with water at a much cheaper rate than when the undertaking became the property of the Corporation in 1876. Then there will be the steady growth of the income derived from water-rents as the population and industries of the district advance. Moreover, as soon as the new works provide the necessary supply by gravitation, it is estimated that £20,000 a year will be saved to the department on the present cost of pumping. Taking everything into consideration, the Committee calculate that the outlay can be met without an increase of the rates, and that in the course of comparatively few years, the expenditure and income will balance, and permit of a gradual reduction once more in the rents. But the economical advantages of the scheme do not end here; for it is estimated by some curious experts that the superior softness of the Welsh water will represent a saving to the inhabitants of about £35,000 per annum in soap alone—to say nothing of the saving to manufacturers in the lessened scaling of boilers.

The Water Committee brought their scheme before the City Council in April last, and practically by a unanimous vote the Committee were authorized to obtain from the Engineers reports as to the works proposed, with estimates of the cost, and further to proceed with the preparations for promoting a Bill to be brought before Parliament in 1892 for the purpose of carrying out the scheme. One reason which made it imperative on the Council not to delay the matter, but to decide to go at once to Wales if they went at all, was the fact that the London County Council were being advised to obtain their supply of water for the whole of the Metropolis from the head waters of the River Wye, including its tributaries—the Elan and Claerwen. The scheme is by far the largest and most important the City Council has ever undertaken; and if, on receiving the report of the Committee, it is decided to proceed with the work, a meeting of the ratepayers will be immediately called to ratify their decision.

Anglo-American Construction Company, Limited.—This is the title of a Company just registered with a capital of £100,362, divided into 10,000 shares of £10 each, 12 shares of £1 each, and 7000 shares of 1s. each. The objects in view are stated to be: "To undertake, in any part of the world, the construction, equipment, completion, maintenance, or working and carrying on of any railway, tramway, dock, harbour, water-works, gas-works, system of electric lighting, or other works of a public or private or commercial character, and to apply for, or otherwise acquire and perform, the obligation of any concession, to deal in stocks and shares, and the business of a loan company generally, to carry on mining operations, land improvements, &c." The principal management and general superintendence of the Company will be in London, with such local boards or agencies in America or elsewhere as the Board may from time to time determine.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

This week the Valuation Committees have been busy revising the lists of the assessors, and hearing appeals against the values put by these public officials upon lands and heritages. I confess that I anticipated there would have been quite a crop of appeals relative to gas undertakings, arising out of the diminished revenues of the past year; but so far as I have been able to ascertain, the only instances in my district in which the valuation of gas-works has been appealed against have been Kirkwall and Brechin. That there have been so few, I can only account for on the supposition that now the law has been definitely interpreted, there is no difficulty in arriving at a correct valuation of public works. The principle which has been laid down for the guidance of assessors is that in the case of public works which are not conducted for profit, the valuation is to be arrived at by taking the balance between income and expenditure, and after deducting a percentage as tenants' profits, to hold the outcome as the rent which a tenant would pay, or, which is the same thing, as the yearly value. The system may be a readier means of ascertaining the current value of an undertaking than would be the other method of taking the actual outlay upon the works and allowing a percentage for depreciation; but it also has its disadvantages. One of these is the variation which it thrusts upon the valuation roll from year to year. If the year be a prosperous one, the valuation is raised; and on the other hand, if it be an unfavourable business year, the valuation is depressed. The owners of the undertaking thus pay rates, not upon the heritable property they possess, but upon the amount of profitable business which they do. Not only is this system of valuation troublesome to the assessor, whose valuation goes up and down erratically, but it is also a vexation to the owners of the gas undertaking. To take Edinburgh and Leith as an example, the valuation of the gas undertaking in the year 1888-89, when the transfer took place, was low, and the rates and taxes paid only amounted to about £4500. The year following, on account of a large profit balance in the preceding year, the Gas Commissioners paid £8300 in rates and taxes. In the year 1890-91, the balance of profit having fallen, rates and taxes amounted to only £7943. Then in the past twelve months, as is well known, the balance of profit was again smaller; and the result is that for the current year the valuation of the whole undertaking has been reduced by the assessor from £62,405 to £51,580—a decrease of £10,825. This reduction has been effected by the assessor without the necessity for an appeal to the Magistrates, the calculations being made upon the principle laid down in the Court of Session. The anomaly arises that, although this may be a very profitable year for the Gas Commission, the amount payable in rates and taxes, if at the same rate as last year, should, because last year was a bad one, be about £1300 less. As the rates are likely to be raised this year, the sum saved to the Commissioners will, however, probably only be about £800.

In the case of Brechin, the assessor reduced the valuation from £1000 to £700; and as the Town Council threatened to object to the reduction, the Gas Company, I presume to take the wind out of their sails, gave notice of an appeal, and claimed to have the valuation reduced to £600. At the Valuation Court yesterday, the assessor explained that he had proceeded upon the principle laid down in the Supreme Court; and no appeal having been stated on behalf of the Town Council, the Gas Company withdrew theirs—the valuation of £700 by the assessor being sustained.

The Kirkwall appeal is more instructive. It was in the case of this Company that the Court, two years ago, laid down the principle of assessing public works by a proportion of the balance of profit. The value of the gas-works was then fixed at £140. Last year the valuation was raised to £200, without objection by the Company. This year, when the assessor again fixed the valuation at £200, the Company appealed, and claimed a reduction to £72, basing their appeal on their accounts. In support of the appeal, it was stated that coal had advanced in price by about 50 per cent. This was not a very intelligent way to put the case; but it was doubtless meant that, on account of the rise in the price of coal, the profits were less. If there was a want of intelligence in stating the case for the Company, there appeared to be the same on the other side. The assessor resisted the reduction on the simple assertion that the value of the gas-works had not dropped from £200 to £72; and on the sentiment that "they could not go in the face of the assessor," the Magistrates sustained his valuation. One member of the Court supported the assessor with remarks which, in the circumstances, were foolish; but which, though stated against the Company, go to show that the authorized method of assessing public works is not a satisfactory one. This gentleman remarked that "the usual and reasonable course pursued by business people who had to pay an extra price for their material, was to put an additional charge on the price of their goods. If the Gas Company had to pay more for their coal, could they not recoup themselves by raising the price of gas?" Now it was not the price of gas which was before the Court. It was not a question of whether the Gas Company were able to make ends meet, but whether they had earned a profit which entitled the assessor to fix the valuation at the figure he did. It is to be observed that if the Gas Company were to raise the price of gas, they would have a larger balance of profit, and would thus be also raising the valuation of their works; and that, under the existing mode of valuing such undertakings, they have simply to be worked at a low profit to keep down the valuation. Were a company, say a month before their financial year closes, to roughly balance their books and find that their revenue was much higher than their expenditure, they might, for that month, reduce the price of gas to a figure which would leave only a balance sufficient to pay dividend; and in that way they would be able to have their works entered at *nil*. Such a result would, better than anything else, show the need for a revision of the existing method of valuation.

The Dundee Gas Commission, which is the Local Authority for Dundee under the Electric Lighting Provisional Order, met on Monday and resolved to proceed with the introduction of a low-pressure installation, at an outlay of from £15,000 to £20,000. That the Commission is taking up the matter in a half-hearted way, and not because they consider it a profitable or desirable undertaking, was shown by the lackadaisical manner in which the speakers recommended it to them. Both the mover and seconder admitted that there would be a loss on the transaction; and the former gentleman said that "if they did not now carry out the work, they would not be heard if they tried to prevent any company appearing on the scene." The Commissioners are obliged to go in for an electric lighting installation in order to keep out speculators. They are not to blame for taking up the business; but surely there is blame somewhere when an unwilling Board is forced to take up a losing business.

In connection with their proposals for procuring an additional water supply, the Water Trustees for Edinburgh and district recently instructed Mr. W. Anderson, their Treasurer, to prepare a statement showing the assessments necessary to meet the cost of the new works. Mr. Anderson's report was issued yesterday. He finds that with a domestic rate of 6d. per pound—the present rate—the surpluses arising each year would be sufficient to meet the charges until 1896-97, when, in the event of the St. Mary's Loch scheme being adopted, there would require to be an increase in the rate of ½d. per pound; and in the succeeding years the rate would require to be raised as follows: 1897-98, 8½d.; 1898-99, 9d.; 1899-1900, 10½d.; 1900-1, 9½d.; 1901-2, 9½d.; 1902-3, 9½d.; and 1903-4, 8½d. In the event of the Manor or Tweed scheme being adopted, there would be no deficiency till 1899-1900. The rates for that and following years would be as follows: Manor, 9d.; 8½d.; 8d.; 8d.; and 7d. Tweed, 9d.; 8d.; 8d.; 7½d.; and 7d.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

The Falkirk Joint-Stock Gas Company are just now busy with extensions at their works. Large purifiers and condensers are being erected, and other alterations are being made. It is very evident, from the way in which their works are being hemmed in and their working space limited, that the Falkirk Gas Company must very soon endeavour to secure greater facilities for carrying on their manufacture. The increase in the demand for gas within the town and suburbs of Falkirk, is very marked. I learn from Airdrie that the Gas Company are getting a set of four new purifiers put down, for which a new house is being erected, and they contemplate the erection of a new gasholder of large dimensions in the course of next season. At the Dawsholm works of the Glasgow Corporation Gas Commissioners, two sets of large condensers have just been completed, of the dry-box type, with vertical flange pipes, 12 inches bore by 12 feet long, set three pipes in height. There are in all 1248 pipes, in eight divisions, with valves so arranged that the gas may be worked through one or more divisions, as may be found necessary. Collectively, these groups of pipes form a very neat set of condensers. They are in all respects like the large block of condensers which the same firm of engineers erected last year at the Tradeston works of the Gas Trust, with the difference that in the latter case the pipes were of 9 inches bore and 9 feet in length. Under the superintendence of Mr. M'Gilchrist, of Dumbarton, important alterations are at present being made at the Renfrew Gas-Works. These include the construction of a new roof for the retort-house, a new scrubber, &c. There are prospects of new gasholders being put down and other extensions made at various places in the course of next season; so that it is quite evident that the days of gas lighting in Scotland are not numbered.

Notwithstanding the fact that the consumption of gas goes on increasing in Rothesay, the Town Council, or some of them, will continue to harp on the progress of electric lighting elsewhere, and bother their colleagues with their desire to see gas lighting in their own town superseded, at least on the public streets, by the so-called "light of the future." At the last monthly meeting of the Rothesay Town Council, one of the magistrates asked if the time had not arrived when they should consider whether or not it would be desirable to have their public thoroughfares electrically lighted. The present system, he said, had proved a comparative failure. If there is any failure in lighting the streets by gas, it must be owing to faults on the part of the lamplighters or the town officials and municipal authorities whose business it is to see that the work to be paid for is really done. Another member of the Council said that if the lamplighters got the hint that the electric light was likely to be adopted for the public streets, it would make them look better after their duties. He further remarked that they had lots of water going to waste in the "lade" which might be used for the production of the electric light; and he thought that if this could be done at an expenditure of about £1000, the actual cost would be less than at the present time, and the lighting would be more satisfactory in every way. One of his colleagues stated that one of the Glasgow bailies had been in Rothesay lately; and he had wondered why the power of the flowing water in the town lade was not applied in the manner suggested. Dean of Guild Macalpine said he was very much in favour of the electric light; and the only thing he was sorry for was that they had gone in for so much expenditure recently in the reconstruction of the gas-works. In the event of the electric light being adopted, their gas-works would be of no use except for supplying cooking ranges! Bailie Walker put in the remark that the Town Council had been warned about that, and the discussion broke off like a knotless thread; still, after a lapse of some months, when the lamplighters have again been careless in the performance of their duties, it may once more be taken up. It would be well, I think, if the Rothesay "powers that be" would see that really good gas is supplied to the consumers; and then there would be less probability of the electric light being talked of at their monthly gatherings.

But Rothesay is not the only place where the quality of the gas has lately been called in question. I refer to the town of Beith, in Ayrshire, where people are said to be complaining both of the poor quality and the dearness of the gas; and warning has been given to the Directors of the Gas Company that they will have themselves to blame should a large number of the consumers go in for paraffin this season. I am rather surprised to find in one of the Paisley papers a serious complaint about the quality of the gas which is supplied by the Gas Corporation. A correspondent, signing himself "Lux Benigna," considers that he and many other gas consumers have room to find fault,

not with the cheapness of the gas, which is only 2s. 10d. per 1000 feet, but with its quality. He says that they are only getting visible darkness. Perhaps it is so; but certainly it is not to the interest, nor is it the desire, of Mr. Hislop, the Gas Manager, that they should get anything but really good gas, which is both free from impurities and has a fairly high illuminating power.

The Glasgow pig-iron market has been quiet during the past week; and Scotch warrants have remained steady at about 47s. 5d. per ton cash, closing yesterday at that price. Considerable fluctuations have taken place in Cleveland and hematite warrants, and rather more business has been done all round during the week, both with consumers and for shipment. Speculators, however, are taking very little interest in the market.

The firmness in the Glasgow and West of Scotland coal trade has continued this week; main sorts bringing a trifle more than last week. The feature has been the distinct hardening in splint, owing to the high price of gas descriptions causing some of the demand to be thrown on splint. However, no advance has been made on 9s. per ton f.o.b. The export business has continued steady throughout, the bulk of the coal despatched going to the Baltic, while further shipments were sent to Canadian ports. Freights are still favouring shipments; and were waggons more plentiful, the volume of business in this direction would be extended. Collieries are fully engaged. However, the home consumption is not satisfactory; and, therefore, a halt in the present briskness may be expected before the winter is far advanced. Dross of the better class has moved off well; but inferior sorts have been as difficult to cash as hitherto.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 19.

Sulphate of Ammonia.—The suddenly weaker tendency, and the abatement in values, notwithstanding the unaltered strong position of the market generally, has perhaps astonished nobody more than those who, by their manipulations, have been endeavouring to bring about the present dulness. That the turn of the market can only be due to a speculative movement, may be judged from the fact that makers are offering very little either for prompt or forward delivery; and if it is the intention of dealers to secure forward contracts at cheap rates, by bringing spot prices down to a low level, they are likely to be disappointed, for producers will hardly care to sell for future delivery at the point at which prices are already, and which, as previously said, are far too low in comparison with nitrate. At this time last year, nitrate was 8s. 6d. per cwt., and sulphate, £11 12s. 6d. In 1889, nitrate was quoted at the same price; while £12 was realized for sulphate. To-day, nitrate is 9s.; and sulphate only £10 12s. 6d. This strange anomaly is hardly likely to continue; and the dealers who are quoting £11 and £11 2s. 6d. for spring delivery, may ultimately burn their fingers. The orders for near delivery are meanwhile absorbed by the dealers, who thus seek to obtain control of the market. But makers will serve their own interests best by selling only, as they have done recently, their sulphate as they produce it.

LONDON, *Sept.* 19.

Tar Products.—This market in all positions is distinctly sluggish. Benzols are more freely offered; but buyers seem to have closed their books for the present. Pitch makers and buyers appear to have both withdrawn from the market in the meantime. A small business is reported in anthracene, "B" quality; but both it and "A" quality do not find a ready sale. Creosote and common oils are dull. There is, however, some inquiry for lucigen purposes; and it is not unlikely that the price of filtered oil for this purpose will be better as the season advances. Important tar contracts have been booked at 24s. 9d. in one instance, and 28s. in the other; the latter being a very rich thin tar. Prices obtaining during the week are: Tar, 24s. 9d. to 28s. Pitch, 33s. to 34s. Benzol (nominal), 90's, 4s.; 50's, 2s. 10d. Toluol, 1s. 5d. Solvent naphtha, 1s. 5d. Crude naphtha, 1s. 2d. Creosote, 1⅝d. Carbolic crystals, 6d.; crude, 60's, 1s. 3d. Cresol, 8d. Anthracene (nominal), "A" quality, 1s. 3d.; "B" quality, 11d.

Sulphate of Ammonia.—There is a decidedly better feeling in this market; and with the shorter shipments of nitrate, together with the reported duty to be imposed on that article, sulphate by reflection is certain to be dearer. Business has been done during the week at prices ranging between £10 10s. and £10 15s., less the usual discount; while for forward delivery, 10s. per ton advance on these prices can be obtained. Gas liquor is quoted at 4s. 6d. to 5s. 6d.

Harrow District Gas Company.—The report of the Directors of this Company, to be presented at the meeting of shareholders next Monday, intimates that, notwithstanding the increased price of coal and material, the position of the Company has been maintained. The balance of the profit and loss account is £1907, out of which the Directors recommend the declaration of a dividend at the rate of 7½ per cent. per annum on the original "A" capital, of 7 per cent. per annum on the first additional "B" capital, and of 5¾ per cent. per annum on the second additional "C" capital, all less income-tax.

A New Gasholder for Walsall.—Last Thursday a new gasholder, having a capacity of 600,000 cubic feet, was brought into use at the Pleck Gas-Works of the Walsall Corporation. The ceremony of turning on the gas to the holder was performed by the Mayor (Mr. Alderman S. Russell), who, in the course of a few remarks, said that the contractor for the holder (Mr. Jesse Tildesley, of Willenhall), and those for the tank (Messrs. Bentley, of Leicester), had done their work in a most satisfactory manner. He also congratulated the Gas Manager (Mr. J. Tindall) on the successful completion of the work, for the specifications, plans, and other details of which he was responsible; and he afterwards referred to the great increase in the business of the department. He added that, although the gasholder had cost £8200, there had not been a single extra, nor had there been the slightest hitch between the two contractors. Congratulatory speeches were also made by other members of the Corporation.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

All the better qualities of round coal continue in active demand; and with the orders coming to hand in most cases, taking away practically the whole of the present output, with very little stock going down for ensuing winter requirements, prices necessarily have a hardening tendency. Although there is no generally announced upward movement, several of the collieries have, during the past week, sent out lists announcing advances of 6d. per ton on various descriptions of round coal; and any concessions upon list rates made during the summer months are for the most part now being withdrawn. At the pit mouth, best Wigan Arley coals can now scarcely be quoted at anything under 12s. 6d. per ton; and good second qualities of Arley are firm at 10s. 6d. to 11s. Although Pemberton 4-feet coals are still being quoted at 10s. to 10s. 6d., the maximum figure is now more nearly the general selling price; while common house fire coals are firm at 9s. to 9s. 6d. per ton. With regard to steam and forge coal, the inland demand for these continues only moderate; and prices remain unchanged from those last quoted—ordinary descriptions being still obtainable at about 7s. 6d. to 8s. per ton, with some better qualities quoted at 8s. 3d. per ton at the pit mouth. But for shipment there has been an increased inquiry coming forward; and rather better prices have been obtainable at the ports on the Mersey. Ordinary descriptions of steam coal are now fetching about 9s. 6d., and better qualities 10s. per ton, with house fire qualities of coal realizing about 11s. 6d. per ton delivered at the Garston Docks or the High Level, Liverpool; but in the last-named quality, colliery proprietors have, as a rule, very little to offer. Engine classes of fuel remain generally without improvement—supplies being still largely in excess of requirements; and to clear off quantities promptly, and to liberate waggons for the round coal trade, colliery owners in many cases are willing to take very low figures. At the pit mouth, burgy still averages about 6s. 6d. to 7s.; the best qualities of slack, 5s. 6d. to 6s.; with common sorts obtainable at from 3s. to 4s. per ton.

Northern Coal Trade.—There is a slight ease this week in some branches of the coal trade, which is not unusual at this season. Best Northumberland steam coals are rather quieter; and the price may now be quoted as from 12s. 3d. to 12s. 6d., though some of the chief collieries have still a fortnight's orders ahead. Small steam coals are in very abundant supply; and the price is weak at 4s. to 4s. 6d. per ton. For gas coal there is an increasing demand for the local as well as the great southern companies; and more foreign contracts are coming into the market. The price is steady, as the output is well taken up just now; and for best Durham coals, it varies from 9s. 6d. to 10s. free on board, according to the amount of coal that the collieries have free for disposal, after the supply of the contracts they have entered into. Very large quantities of gas coals are now being sent to some of the Mediterranean ports. Bunker coal is quiet; the price varying from 9s. for the unscreened sorts up to 12s. per ton for the best Durham screened qualities. There is a little more inquiry for manufacturing coals, as more orders for steamers are known to have been given out to Tyne and West Hartlepool shipbuilders. Coke is quiet, though the iron trade is rather better—the price of best blast-furnace coke being about 15s. 6d. free on board. There is no alteration in gas coke yet.

The Etoile Gas-Lamp Syndicate, Limited, has been registered, with a capital of £10,000 in £10 shares, to acquire certain letters patent known as W. A. Fourness' patent for gas-lamps, and "to develop and turn the same to account."

Thirsk Gas Company.—It was announced at the meeting of this Company last Wednesday, that the business had continued to progress during the past half year, and that the Directors had been enabled to reduce the price of gas to 4s. per 1000 feet for lighting purposes, and to 3s. 4d. for cooking and heating, and also the meter-rental by one-half. A dividend at the rate of 4½ per cent. per annum was declared.

Gas Exhibition and Cookery Lectures at Wallasey.—It is now five years since the first exhibition of gas appliances was held at Wallasey, which resulted in the letting out of about 200 stoves. The large number then hired rather alarmed the Gas Committee; and they ceased to let out stoves for a time. As, however, most of the stoves have since been purchased by the users through the Gas Engineer's (Mr. H. Ashton Hill's) instrumentality, the Board recently decided to let out another 100. Messrs. Richmond and Co., Limited, of Warrington, secured the order; and last week they held an exhibition in the centre of the Wallasey district at the Concert Hall, Liscard. As a result, they have let out within a very few the whole number of stoves arranged for. Miss Thwaites, of Liverpool, delivered lectures daily; and Mr. E. W. T. Richmond gave two addresses on the opening day. The exhibition has been extended into this week.

The Gas Supply of the Salford Out-Townships.—Alluding to the agitation for the establishment of independent gas-works for the Salford suburban districts (the various phases of which have been reported upon from time to time in the JOURNAL), a local correspondent writes: The paper on the subject of "Differential Rates," which Mr. Thomas Newbigging read at the last meeting of the Manchester District Institution of Gas Engineers had an obvious reference to the agitation which has been going on for some time past in Swinton, Eccles, and other towns of the Salford out-district. It may be earnestly commended to the attention of the gentlemen who are talking about forming a combination of local interests to erect new gas-works, and rid themselves of what they regard as the tyranny of Salford. Mr. Newbigging takes an eminently practical view of the subject. The local papers have, however, so far failed to see the important bearing of his paper; and because their district, and the local agitation were not referred to by name, they have not understood its direct application. But the Salford Gas Committee can hardly have overlooked an opinion which makes so largely in their favour in this controversy; and they might do worse than get the author's permission to reprint and circulate the paper for the information of their consumers in the out-districts.

The South Kent Water Company are now contemplating getting to work with their main-laying operations. It is intended that the first section of pipes through Hadlow will connect with the low service reservoir; while Gondhurst, Cranbrook, and Hawkhurst will be on the high service. In all, about £17,000 of capital will be required. The Company are authorized to raise £52,000 of £10 shares; but the first issue will only consist of £2000. A bore-hole has been put down at Hadlow at a depth of 800 feet; and an ample supply of soft water from a sand-bed has been tapped. Dr. Lawrence, of Tonbridge, has made an analysis of the water, and has certified it to be excellent.

The Lighting of Inverness.—At a meeting of the Inverness Police Commissioners on Monday of last week, attention was directed to the report of the Manager of the Corporation Gas-Works (Mr. J. Thomson), in which it was stated that, owing to the yearly increasing consumption of gas in the town, additional machinery and holders would soon be required at the gas-works, the cost of which he estimated at about £10,000. Bailie Ross thought that the Commissioners, before embarking on such a heavy expenditure, should consult a practical engineer on the subject of lighting the town by electricity. It had, he said, been suggested that the necessary motive power might be obtained from the River Ness, or from Loch Ness, or even from the Fall of Foyers. He formally moved the appointment of a Committee to make full inquiry into the whole scheme of electric light being introduced into the town.

The Accrington Town Council and Electric Lighting.—Only three weeks ago, we reported that the Accrington Town Council had been endeavouring through a Committee, to enter into arrangements with the Gas and Water Company for the transfer of their works and plant; and that, the negotiations having failed, the Committee were asked to examine into, and report upon, "the tactics and irregularities" of the Company with reference to the payment of back dividends and other matters. Since then the Legal and Parliamentary Committee have come to the conclusion (notwithstanding this recent desire of the Corporation to become possessed of the gas supply) that it is desirable the Council should forthwith proceed to establish works for the supply of electricity for lighting purposes, under the powers conferred by the Electric Lighting Order they obtained last year. It appears a little curious that they did not arrive at this decision before.

The Water Supply of Pudsey and District.—At the meeting of the Pudsey Local Board yesterday week, the position in which the water supply of Pudsey, Farsley, and Calverley now stood, since the purchase by these Boards of the plant and undertaking of the Calverley District Water-Works Company, was referred to. It was stated that valuers were now engaged ascertaining the rents received and the number of miles of pipe and their respective diameters in each Local Board district; and until this was done and other minor points settled, they would not be able to allocate the respective portions due from each Board of the £13,000 purchase-money of the plant and undertaking. There was, however, a unanimous feeling on the part of the three Boards that the matter should be settled in a businesslike way. Mr. Forrest thought that the fairest and most equitable way to arrive at a settlement would be to take as a basis the rateable value of each Board's district. Mr. Isaac Gaunt, however, pointed out that the rateable value of Pudsey was £38,409; Farsley, £14,206; and Calverley, £13,771; and that it would be unfair to arrive at the amounts to be contributed by the respective Boards either on the basis of rateable value, population, or area of each district. He confirmed the statement referred to above, that the only wish of the Joint Committee was to be fair to each other.

Alleged Contamination of Water by Gas at Driffield.—Legal proceedings are pending between Mr. A. Spencer, a confectioner, of Driffield, and the Gas Company with respect to the alleged fouling by gas of the water supply of the former—his premises being contiguous to the gas-works. The matter was referred to at the last meeting of the Local Board. Mr. Spencer's Solicitors (Messrs. Jennings and Co.) wrote suggesting a thorough and exhaustive examination of the works and the surrounding soil at once; and the Medical Officer (Dr. Wood) reported that he had found products arising from the manufacture of gas, this being perceptible to both taste and smell. On the other hand, it was stated that samples of the water alleged to have been contaminated had been taken on behalf of the Company, and analyzed by Mr. G. C. Robinson, of the Royal Institution, Hull, who reported that they were remarkably pure and free from contamination, and that he found an entire absence of bodies likely to be derived from the products of gas manufacture. The Board resolved that, as proceedings were pending between Mr. Spencer and the Company, the matter should be referred to a Committee, to consider whether or not any action should be taken. While denying that there is any foundation for Mr. Spencer's allegation, the Directors of the Company, in order to remove even an imaginary ground of complaint, have offered to furnish a supply free of charge from the local Water Company; but this has been declined.

The Use of the Divining Rod for Water Discovery.—Until last week nothing had for some considerable time been heard as to the doings of "professors" in the mystery of the divining rod; but most of the London papers on Tuesday published the following paragraph: An instance of the successful use of the divining rod for the discovery of water has been experienced at Braintree, Essex. Captain A. K. Barlow, who recently purchased the estate of Lynderswood, in the neighbourhood, had made several borings for water, but without the desired result; and he had reluctantly made up his mind to sell the estate, and remove to the neighbourhood of Ipswich. But being strongly urged by his wife and Mrs. Christie Miller, the wife of the *savant* of that name, to try the divining rod, he, without having much faith in the efficacy of the powers of the hazel twig, resolved to send for John Mullins, of Chippenham, Wilts. Mullins came, and stayed the night at Lynderswood. Next morning he walked up and down a portion of the estate with a lot of hazel twigs before him; and eventually he marked a spot about 250 yards from an empty well. Mullins remarked that this spot was the very best place to sink a well; and if it was bored 50 feet, a capital supply of water would be found. Captain Barlow paid Mullins his fees and expenses, and set men on to dig a well at the place marked; and they have, at a distance of 34 feet from the surface, dug right into a fine body of water in a gravelly soil.

The Carlisle Gas-Works Employees' commemorated the marriage of Mr. J. Holliday, the Assistant Engineer, by a supper last Friday evening. Mr. J. Hepworth, the Engineer, was present, and about 60 persons sat down to the repast. A toast expressive of good wishes for Mr. Holliday's prosperity was drunk with much enthusiasm; and the rest of the evening was agreeably spent in speech and song.

The South Metropolitan Gas Company's Kennington Oval Holder.—At last week's meeting of the Lambeth Vestry, a letter was read from Mr. N. M. Taylor asking the Vestry to adopt some measure to prevent the South Metropolitan Gas Company extending their large gas-holder near Kennington Oval, inasmuch as it was "becoming a serious danger to the surrounding neighbourhood." Mr. White said he believed the Company were entitled to raise the holder to whatever height they liked. He moved that the letter be referred to the Law and Parliamentary Committee; and this was agreed to.

Maryborough (Queensland) Gas Company.—Owing to the continued depression of business in the colony, combined with the increased cost of coal in consequence of the late labour troubles, the profits of this Company for the first half of the present year showed a considerable falling off. Including the balance brought forward at Jan. 1, there was an amount of divisible profits of £1166; but nearly ½ per cent., or £53, was needed for "dividend tax." This sum allowed a division at the rate of 8¼ per cent. per annum; and this proposal of the Board was confirmed at the meeting of shareholders on July 31.

Issue of New Stock in the Leighton Buzzard Gas Company.—On Monday of last week, there was submitted to public competition at Leighton Buzzard, £4250 of new ordinary stock in the local Gas Company. The stock was divided in 85 lots of £50 each; and they realized from £57 to £60 10s., or an average per lot of £59 1s. The total amount produced was £5019. Under the provisions of the Act incorporating the Company, new ordinary stock carries a maximum dividend of 7 per cent. per annum when a dividend of 10 per cent. is paid on the original stock. At the present time a dividend of 8 per cent. is paid on the latter; and therefore the dividend payable on this new stock will be about £5 12s. per cent.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 536.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	,,	7½	Do. 7 p. c.	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	28 May	8	Bahia, Limited	20	13—15	..	10 13 4
200,000	5	13 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	157—162	..	5 14 2
220,000	20	16 Sept.	11½	Brighton & Hove Original	20	40—42*	..	5 9 6
320,000	20	10 Apl.	11½	British	20	45—47	..	4 15 9
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18—20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13—15	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	7—8	..	—
200,000	100	1 July	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	10 Apl.	13¾	Commercial, Old Stock	100	255—265	..	5 3 9
130,000	,,	,,	10¾	Do. New do.	100	250—260	..	5 7 6
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	230—240	..	3 3 4
200,000	,,	,,	7	Do. 7 p. c. Pref	100	190—200	..	3 10 0
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	197—202*	+2	4 19 0
486,090	10	15 July	10	European, Limited	10	20—21	..	4 15 3
354,660	10	,,	10	Do. Partly paid	7½	14½—15½	..	4 16 9
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	229—234	..	5 11 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	254—259	..	3 17 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118—123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172—177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	159—164	..	4 5 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	153—158	..	3 16 0
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120—125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	230—235	—1	5 2 1
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¼—4¾	..	6 6 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	111—113	..	4 8 6
541,920	20	11 June	6¼	Monte Video, Limited.	20	16—17	..	7 12 11
150,000	5	28 May.	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	25 Mar.	7	Ottoman, Limited	5	4¾—5¼	..	6 7 3
166,870	10	26 Feb.	2	Pará Limited.	10	2¾—3¼	..	—
				People's Gas of Chicago—				
420,000	100	4 May	6	1st Mtg. Bds.	100	92—97	..	6 3 9
500,000	100	1 June	16	2nd Do.	100	90—95	..	6 6 4
150,000	10	28 Apl.	10	San Paulo, Limited	10	13—15	..	6 13 4
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	278—283	..	5 9 6
1,350,000	,,	,,	12	Do. B do.	100	230—235	..	5 2 1
200,000	,,	,,	13	Do. C do.	100	240—245	..	5 6 1
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	141—145	..	3 9 0
60,000	5	16 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13*	..	4 8 5
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	264—269	+2	3 14 4
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	211—216	+2	3 14 3
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138—143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	109—114	+2	3 10 2
708,000	Stck.	13 Aug.	10½	Kent	100	270—280	+5	3 15 0
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	237—242	+2	3 18 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	193—198	..	3 15 9
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—123	..	3 5 0
500,000	100	13 Aug.	12½	New River, New Shares	100	341—346	..	3 10 1
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123—126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	166—171	+1	3 16 0
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160—165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex.	100	255—260	+2	3 16 7

*Ex div.

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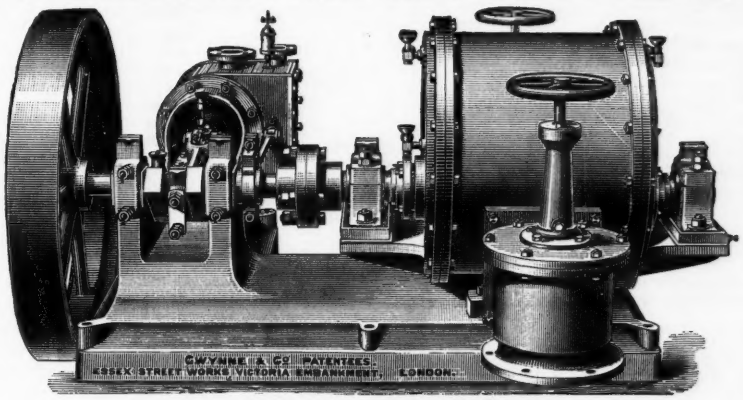

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Address, stating wages given, FITTER, care of Mr. Edmonds, Pennington, Lymington, HANTS.

WANTED, a respectable, sober, married man as STOKER. Must be well acquainted with the working of an Engine and Exhauster. Wages, 22s. per week with Bonus. Sunday holiday once a month, and a week's holiday in the Summer, with pay.
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(GAS DEPARTMENT.)

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One able to fix Meters and do rough fitting work, and accustomed to Gas-Works preferred.
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Wigan, Sept. 11, 1891.

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Manager.
Gas-Works, Altrincham,
Sept. 18, 1891.

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Prices per unit on the Works to be sent to
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Engineer and Manager.

TO CHEMICAL MANUFACTURERS.

THE Rastrick Gas Company are prepared to receive TENDERS for the purchase of the GAS TAR and AMMONIACAL LIQUOR made at their Works in Rastrick for a period of One year from Oct. 1, 1891.
Tenders, stating price per ton, to be sent in on or before Saturday, Oct. 3, 1891.
RALPH FEARNLEY,
Secretary.

THE Stretford Gas Company are prepared to receive TENDERS for the supply of about 125 tons of OXIDE OF IRON, delivered at the Gas-Works, Stretford, carriage paid.

Tenders to state the percentage of Iron each ton of Oxide contains, and also the quantity per cent. of moisture contained therein, which shall not be exceeded in each and every ton of the material delivered.

Tenders are also invited for about 180 tons of SPENT OXIDE.

Tenders to be addressed to the Chairman, and endorsed "Tender for Oxide," on or before Monday, Oct. 12, 1891.

No tender necessarily accepted.

BENJAMIN HAYNES,
Secretary.

TENDERS FOR GAS COAL.

THE Malvern Local Board invite TENDERS for the supply of 1000 tons of best screened SILKSTONE, and 1000 tons of best screened WIGAN GAS COAL, to be delivered and stacked in the Gas-Works at Great Malvern, as follows: 500 tons of Silkstone and 500 tons of Wigan before November 30 next, and the remainder in such quantities as may be required from time to time.

Tenders, endorsed "Tender for Gas Coal," to be sent to the undersigned, before Twelve at Noon on Monday, the 28th inst.

The Board do not bind themselves to accept the lowest or any tender.

WM. LAMBERT,
Clerk to the Board.

Local Board Offices, Malvern,
Sept. 18, 1891.

TENDERS FOR TAR.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the surplus TAR they will have for disposal during the Twelve months ending Sept. 30, 1892—namely, about 1800 tons, to be divided into Three contracts of 600 tons each.

The Company will probably dispose of the total surplus of approximately 1800 tons in One, Two, or Three contracts as the Board may decide; but they do not bind themselves to accept the highest or other tender or tenders.

Tenders must be addressed to the Chairman of the Finance Committee of the Derby Gaslight and Coke Company, Friar Gate, Derby, endorsed "Tender for Tar," and delivered on or before Tuesday, the 29th day of September, 1891.

Further particulars may be had on application.

By order of the Directors,
RICHARD FISHER,
Secretary.

Derby Gas Office,
Sept. 5, 1891.

Price: 10*s. per* 100; £1 2*s.* 6*d. for* 250; £2 *for* 500; £3 15*s. per* 1000. *Specimen copy (by post),* 4*d.*

The Use and Value of

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EAST LONDON WATER-WORKS COMPANY.

NOTICE is hereby given that the HALF-YEARLY ASSEMBLY of Proprietors will be held at the Company's Office, St. Helen's Place, Bishopsgate, E.C., on Tuesday, the 6th of October, 1891, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The Transfer Book in respect of the Ordinary Stock will be closed on the 22nd of September inst., and re-opened on the 13th of October, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, E.C.,
Sept. 15, 1891.

COMMERCIAL GAS COMPANY.

NOTICE is hereby given that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Friday, the 9th of October, 1891, at Twelve o'clock at noon—

To Receive the Report of the Directors,
To declare a Dividend,
And for other Business.

The Stock Transfer Books will be closed from the 26th of September inst. to the 9th of October next, both days inclusive.

By order of the Board,
H. D. ELLIS,
Secretary.

Offices, Stepney,
Sept. 17, 1891.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given, that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 30th inst., at half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is hereby also given, that the Transfer-Books of the Company will be closed on the 19th inst., and re-opened on the 1st of October.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C., Sept. 9, 1891.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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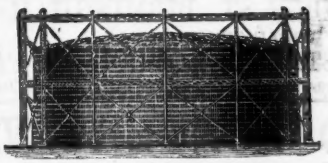

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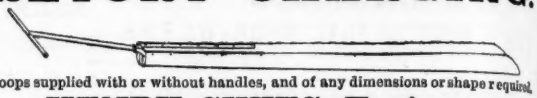

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Illuminating Power	38·22 candles.
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Illuminating Power	16·3 candles.
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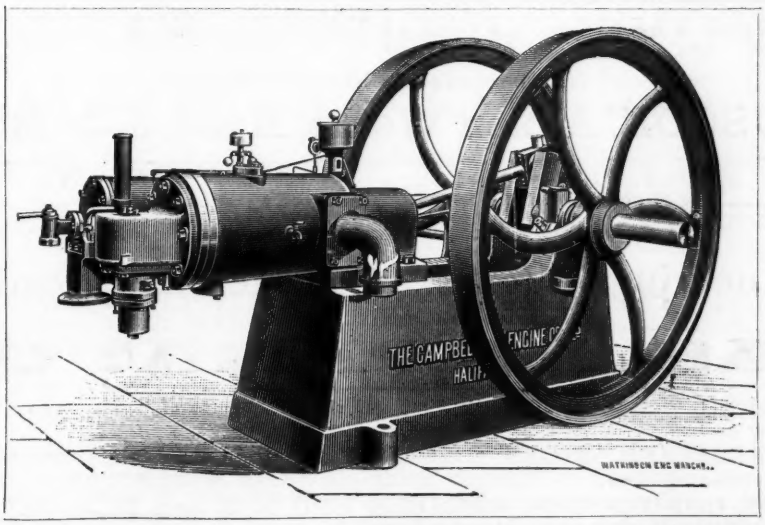

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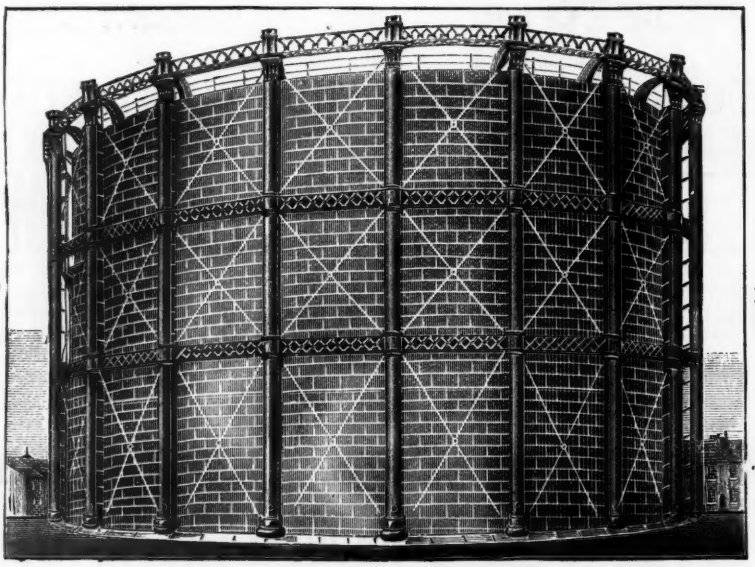

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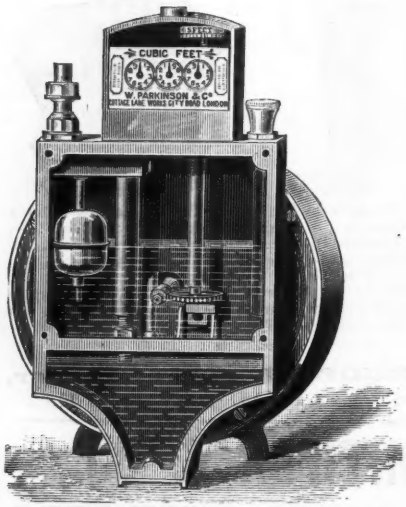

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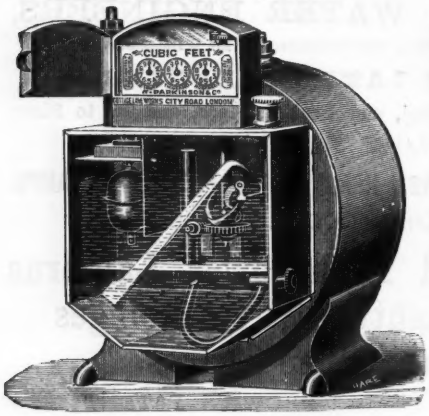
IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.



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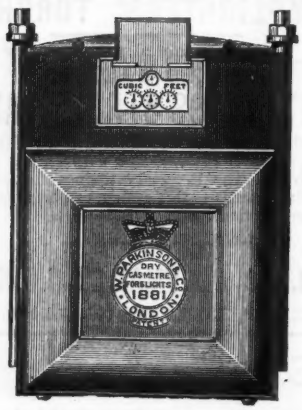
The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.



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[See also Advt., p. 522.

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